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A line in the sand: prospect theory and Nash arbitration in resolving territorial disputes

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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**A LINE IN THE SAND: PROSPECT THEORY AND NASH
ARBITRATION IN RESOLVING TERRITORIAL DISPUTES**

by

Brett A. DeAngelis

December 2012

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**A LINE IN THE SAND: PROSPECT THEORY AND NASH ARBITRATION IN
RESOLVING TERRITORIAL DISPUTES**

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ABSTRACT

Territorial disputes—often fueled by ethnic animosity or competition for scarce resources—are often catalysts for conflicts that can lead to war. To reduce the prospect of conflict, and larger-scale war, peaceful and enduring resolutions to territorial problems are desirable. The process of conflict resolution should provide parties with a lasting, mutually agreeable outcome. Prospect theory has the potential to determine the types of territorial disputes that may be candidates for an arbitrated resolution. Nash arbitration may provide an optimal solution to both parties, forestalling conflict escalation. This thesis examines how prospect theory and Nash arbitration are applicable, acceptable, and durable, by operationalizing a non-violent approach to territorial dispute resolution. Specifically, prospect theory is integrated into game theory, and Nash arbitration results are geographically implemented. The durability of arbitrated results are also tested.

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I. INTRODUCTION

A. BACKGROUND

Territorial control is a historical and widespread cause for war, with conflicting claims often cited as precursors to conflict.¹ Specifically, border disputes—often fueled by ethnic animosity or resource competition—are often catalysts for territorial conflicts that can lead to war.² For centuries, maps have been used to assert territorial claims, or to settle them.³ While control over territory is cartographically a zero-sum game, this view is perhaps too narrow.⁴ Exploitation of natural resources is an example where a territorial dispute can be considered a partial-sum game; both sides can benefit if the costs of conflict are removed, or both sides can be handicapped by discord.

To mitigate the risk of conflict, and thus larger-scale war, peaceful and enduring resolutions to territorial disputes are desirable. The process should provide all parties with a lasting, mutually agreeable outcome. Prospect theory,

¹ Refer to: Stephen Van Evera, *Causes of War* (Ithaca, NY: Cornell University Press, 1999); Michael Klare, *Resource Wars* (New York: Metropolitan Books, 2001); Paul Diehl and Gary Goertz, "Territorial Changes and Militarized Conflict," *The Journal of Conflict Resolution* 32 no. 1 (1988); Paul Senese and John Vasquez, "Assessing the Steps to War," *British Journal of Political Science* 35 no. 4 (2005); William Reed and Diana Chiba, "Decomposing the Relationship between Contiguity and Militarized Conflict," *American Journal of Political Science* 54 no. 1 (2010).

² Van Evera argues that war is more likely when resources are cumulative. Disputes based on additive resources (that can be readily used to seize more resources) require states to complete more fiercely. Klare highlights that the protection of resources governs state's strategic planning. With the increasing global demand for dwindling resources, disputes over conflicting claims become more acute. He notes other sources of conflict (ethnic hostility, economic injustice, political competition, etc.) will increasingly be linked to disputes over vital materials. Diehl and Goertz conclude the more important a territory in terms of area, the more likely violent conflict will result if control over the area is transferred. Senese and Vasquez find the probability of war breaking out between two states is higher for states disputing territory than for those disputing policy or regime questions.

³ See, Jeremy Black, *Maps and Politics* (Chicago: University of Chicago Press, 1997). Specifically, chapters 1, 5, and 6.

⁴ Moving beyond a material view of terrain, Tuomas Forsberg argues for analyzing disputes with a normative view, stating, "political, social and psychological perspectives of territories and borders are more accurate than a simple geo-graphical one." Tuomas Forsberg, "Explaining Territorial Disputes: From Power Politics to Normative Reasons," *Journal of Peace Research* 33 no. 4 (1996): 438.

by comparing the risk of losses from a defined reference point to conceivable gains, has the potential to determine types of territorial disputes that may be candidates for an arbitrated resolution. With the most arbitrable disputes identified, Nash arbitration may provide an optimal solution to both parties, forestalling conflict escalation.

B. PURPOSE AND SCOPE

This thesis examines whether and how prospect theory and Nash arbitration are *applicable*, *acceptable*, and *durable* for territorial dispute resolution. Resolved and ongoing dyadic border disputes from 1816 to present are considered for analysis. Other types of territorial disputes (e.g., disputes over dependent or colonial properties) are not considered.

C. RESEARCH QUESTIONS

Understanding that prospect theory and Nash arbitration may have utility in territorial dispute resolution, the following research questions are investigated:

1. Under what conditions are territorial disputes most arbitrable?
2. How can Nash arbitration be operationalized to resolve territorial disputes?

D. THEORETICAL FRAMEWORK

This thesis intends to operationalize a non-violent approach to territorial dispute resolution: arbitration. Prospect theory may have utility in determining the arbitrability of territorial dispute cases. As “a leading alternative to expected utility as a theory of choice under conditions of risk,”⁵ prospect theory assigns values to gains and losses from a reference point, rather than valuing final assets.⁶ As Kahneman and Tversky state, “A salient characteristic of attitudes to changes in welfare is that losses loom larger than gains.”⁷ This attitude affects how states

⁵ Jack S. Levy, “Loss Aversion, Framing, and Bargaining: The Implications of Prospect Theory for International Conflict,” *International Political Science Review* 17 no. 2 (1996): 179.

⁶ Daniel Kahneman and Amos Tversky, “Prospect Theory: An Analysis of Decision Under Risk,” *Econometrica* 47 no. 2 (1979): 263.

⁷ Kahneman and Tversky, “Prospect Theory,” 279.

view dispute resolution options, either from a gains frame or from a losses frame. Moving from a domain of gains to domain of losses, or vice versa, causes a flip in preferences that violates the principle of invariance under expected utility. It also explains why leaders do not maximize their choices, overweigh losses with respect to comparable gains, are risk averse when given choices between gains, and are risk acceptant when facing losses.⁸ Therefore, how the conflict is framed is a key component to determining the applicability of arbitration. Specifically, how prospects (e.g., access to resources, control of territory) are combined, segregated, or cancelled during decision making.⁹

While prospect theory may help determine applicability, Nash arbitration can determine the acceptability and durability of dispute solutions by providing a reasonable and fair outcome. Nash arbitration provides a solution point N that incorporates the utilities of each party, while also integrating their strategic position regarding the dispute. Nash solutions are Pareto optimal, and at or above the security level for both players.¹⁰ That is, neither player is forced to accept less than he could guarantee himself by non-cooperative play. Acceptability of N for territorial dispute resolution should be ensured by Nash's four axioms: rationality, linear invariance, symmetry, and independence of irrelevant alternatives.¹¹ Through these, the solution N produces gains for each state that are perceived on par with each other. The durability of a Nash solution can be determined by comparing the geographic implementation of N during different periods of the dispute.

⁸ Jeffrey Berejikian, "A Cognitive Theory of Deterrence," *Journal of Peace Research* 39 no. 2 (2002): 165.

⁹ As would occur in the editing phase. Kahneman and Tversky, "Prospect Theory," 274.

¹⁰ Pareto optimal: there is no other outcome that is better for both players, or better for one and equally good for the other. Philip D. Straffin, *Game Theory and Strategy* (Washington, DC: Mathematical Assoc. of America, 1993), 103.

¹¹ John F. Nash, Jr., "The Bargaining Problem," *Econometrica* 18 no. 2 (1950): 159. See also, John Nash, "Two-Person Cooperative Games," *Econometrica* 21 no. 1 (1953): 136–137.

E. HYPOTHESES

From the theory and literature review, this thesis hypothesizes:

H1: Applicability

Territorial disputes are most arbitrable when both states are in a domain of gains, and less arbitrable when one or both are in a domain of losses.

H2: Acceptability

If both states are in a domain of gains, the acceptability of Nash arbitration in territorial disputes increases (due to parity of perceived gains).

H3: Durability

Nash arbitration is most durable when dynamic dispute conditions generate fewer aberrations to results over time.

F. METHODOLOGY

This thesis utilizes two methods to analyze territorial dispute resolution: empirical case studies and mathematical modeling. Case studies are utilized to determine if prospect theory and Nash arbitration are applicable, acceptable, and durable for territorial dispute resolution. Cross-sectional cases explore both the applicability (via prospect theory) and acceptability for Nash arbitration solutions, and a within-case longitudinal analysis determines the durability of arbitration.

Within the case studies, prospect theory is operationalized by constructing a domain-dependent game that considers each party's default framing of the conflict. This is the first assessment of arbitrability. If required, alternative framing is proposed to increase the arbitrability of the dispute. Of those cases deemed applicable, Nash arbitration is performed to determine its acceptability and durability for territorial dispute resolution.¹²

¹² In order to use Nash arbitration, this thesis must assume that disputes for which arbitration is applicable are partial-sum games. The Nash solution depends on determining the status quo point of the conflict, which will vary according to dispute conditions (e.g., current line of control versus threat/prudential strategies).

The literature does not reference Nash arbitration in the context of territorial disputes, excluding one source.¹³ In his thesis, Fulgence Msafiri utilizes Nash arbitration to demonstrate a fair resolution to a border dispute between Tanzania and Malawi.¹⁴ This thesis goes beyond Msafiri's work by fully developing and operationalizing Nash arbitration in territorial disputes. Specifically, how is the conflict framed, how are utilities determined, and how are the arbitration results (solution points N) geographically implemented?¹⁵

G. ORGANIZATION

Chapter II provides a synopsis of the relevant theory. Fundamentals of prospect theory are discussed, as well as how they integrate into territorial disputes. Nash arbitration is then summarized, and hypotheses are drawn from the theory. Chapter III operationalizes the theory with modeling. Specifically, prospect theory is integrated into game theory, and Nash arbitration results are geographically implemented. Chapter IV provides a case study of the Kuril Islands dispute between Russia and Japan. While the dispute prevents Russia and Japan from signing a peace treaty to formally conclude World War II, it stands out as a candidate for an arbitrated resolution. A game is constructed, arbitration performed, and the result geographically implemented. The durability of the arbitrated result is also tested. An additional case study vignette and solution is provided in Appendix A. Appendix B contains maps optimized for grayscale printing.

¹³ Steven Brams and Jeffrey Togman analyze the fairness of agreements using their 'Adjusted Winner' procedure, which takes into account Nash equilibria. This, however, is a different method than Nash arbitration. See, Steven J. Brams and Jeffrey M. Togman, "Camp David: Was the Agreement Fair?" in *A Road Map to War*, ed. Paul F. Diehl, 238–253 (Nashville, TN: Vanderbilt University Press, 1999).

¹⁴ Fulgence Msafiri, "Escalation and Resolution of Border Disputes and Interstate Conflicts in Africa: The Malawi—Tanzania Case" (master's thesis, Naval Postgraduate School, 2010).

¹⁵ Barzilai and Peleg offer detailed framework for the analysis of border determination. See, Gad Barzilai and Ilan Peleg, "Israel and Future Borders: Assessment of a Dynamic Process," *Journal of Peace Research* 31 no. 1 (1994). Also, Hassner discusses the entrenchment of long-lasting territorial disputes and requirements for resolution. See, Ron E. Hassner, "The Path to Intractability: Time and the Entrenchment of Territorial Disputes," *International Security* 31 no. 3 (2006/2007).

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II. THEORY

A. PROSPECT THEORY

1. Introduction

Prospect theory is a decision making model which assumes an individual's decisions are made under varying conditions and perceptions of risk. Its central assumption is that decisions are influenced by "reference dependence." That is, people are more sensitive to gains and losses from their specified reference point than to overall levels of assets or wealth.¹⁶ This leads to interesting implications for prospect theory that violate the axioms of expected utility (a generally accepted and widely applied theory of decision under conditions of risk).¹⁷ Specifically: how one views, or "frames" her decision can impact the choice made; that people are averse to losses and overweigh a loss with respect to a comparable gain; and that individuals treat gains differently from losses, creating varying risk propensities.

While expected utility may be more parsimonious than prospect theory,¹⁸ it may not fully explain observed behavior.¹⁹ It was evidence of violations of expected utility theory that led psychologists Daniel Kahneman and Amos Tversky to publish prospect theory in 1979, and it has since become a leading alternative to expected utility. Prospect theory predicts that people will respond to certain kinds of situations in ways that "yield distinct and identifiable suboptimal outcomes" when compared to a strictly rational approach to the decision, such as

¹⁶ Jack S. Levy, "An Introduction to Prospect Theory," *Political Psychology* 13 no. 2 (1992): 171, and Kahneman and Tversky, "Prospect Theory," 273.

¹⁷ Including transitivity, dominance, invariance, and cancellation. Levy, "An Introduction to Prospect Theory," 179.

¹⁸ Jack S. Levy, "Prospect Theory and International Relations: Theoretical Applications and Analytical Problems," *Political Psychology* 13 no. 2 (1992): 296.

¹⁹ See, Dina A. Zinnes and Robert G. Muncaster, "Prospect Theory Versus Expected Utility Theory: A Dispute Sequence Appraisal," in *Decision Making in War and Peace*, eds. Nehemia Geva and Alex Mintz (Boulder, CO: Lynne Rienner Publishers, 1997), 183; Levy, "An Introduction to Prospect Theory," 173; and Levy, "Loss Aversion, Framing, and Bargaining," 180–183.

expected utility.²⁰ Prospect theory does have limitations, however. It is not as theoretically well developed as expected utility theory, and applying a theory on individual decision making to the usually collective choices found in international relations has difficulties.²¹ As Tversky and Kahneman state, prospect theory should be viewed “as an approximate, incomplete, and simplified description of the evaluation of risky prospects.”²²

2. Foundations of Prospect Theory

Kahneman and Tversky’s research has many findings regarding an individual’s decision making under risk. Asking hypothetical questions that generally regard monetary exchanges (e.g., Would you rather have a 50 percent chance of winning \$1,000, or would you rather have a guaranteed \$450?), they demonstrated several phenomena that violate the tenets of expected utility theory.²³ These prospect theory foundations are summarized below.

a. Reference Point

People tend to think in terms of gains and losses, rather than in terms of absolute (or final) assets. This categorizes choices as gains or losses from a reference point. While the specified reference point is often the status quo, this is not always the case. Individuals may have a foregone conclusion of

²⁰ Barbara Farnham ed., *Avoiding Losses / Taking Risks* (Ann Arbor, MI: The University of Michigan Press, 1994), 2.

²¹ Despite theoretical weaknesses regarding the editing phase of prospect theory (see Jack S. Levy, “Prospect Theory, Rational Choice, and International Relations,” *International Studies Quarterly* 41 no. 1 [1997]: 100–102), it is well suited to this thesis and retains explanatory power. Regarding the difficulties of moving from individual choice to collective choice, see James D. Morrow, “A Rational Choice Approach to International Conflict,” in *Decision Making in War and Peace*, 16; Jack S. Levy, “Prospect Theory and the Cognitive-Rational Debate,” in *Decision Making in War and Peace*, 43–46; and Levy, “Prospect Theory and International Relations,” 292–293. The literature supports prospect theory as an alternative to analyze state decisions in international relations (see multiple examples in *Political Psychology* 13 no. 2 [1992]), and this thesis intends to move forward with the debate vice remaining paralyzed for a better solution.

²² Amos Tversky and Daniel Kahneman, “The Framing of Decisions and the Psychology of Choice,” *Science* 211 no. 4481 (1981): 454.

²³ Kahneman and Tversky, “Prospect Theory,” 264.

certain gains, and use this “aspiration level” as their reference point.²⁴ Alternatively, individuals may have suffered a loss and use their prior asset position as a reference. Selecting the reference point is heavily dependent on the framing of the decision, which is discussed later in this chapter.

This “reference dependence”²⁵ replaces a utility function defined over all asset levels (as found in expected utility) with a value function defined over deviations from the reference point.²⁶ Reference dependence is important because individuals overvalue losses relative to comparable gains. This is depicted by the steeper value function on the loss side, as opposed to the gains side of the function (Figure 1). This is also a key tenet of loss aversion, discussed later in this chapter.

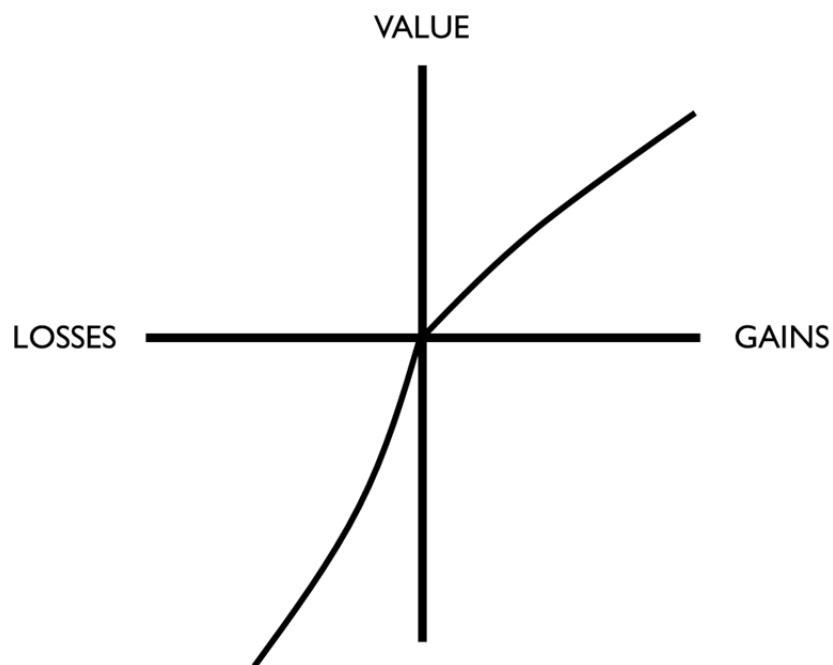


Figure 1. Hypothetical value function.²⁷

²⁴ Levy, “An Introduction to Prospect Theory,” 174.

²⁵ Amos Tversky and Daniel Kahneman, “Loss Aversion in Riskless Choice: A Reference-Dependent Model,” *The Quarterly Journal of Economics* 106 no. 4 (1991): 1039.

²⁶ Levy, “Loss Aversion, Framing, and Bargaining,” 181.

²⁷ From Kahneman and Tversky, “Prospect Theory,” 279.

b. Reflection Effect

People treat losses differently than gains. Specifically, they are risk averse when dealing with gains, and risk seeking when dealing with losses. For example, Kahneman and Tversky found that 80 percent of subjects would prefer a guaranteed \$3,000 to a gamble with an 80 percent chance of \$4,000 and a 20 percent chance of nothing.²⁸ Expected utility places the value of the gamble at \$3,200 and a rational choice would be to maximize gains and take the wager. However, prospect theory states that individuals are risk averse with regards to gains, thus explaining why the majority of people chose the lesser, though certain, amount.

Conversely, when dealing with losses, 92 percent of subjects preferred a gamble with an 80 percent chance of losing \$4,000 and a 20 percent chance of losing nothing to a certain loss of \$3,000. Again, expected utility would presume an individual would minimize his losses and take the sure loss of \$3,000 over the gamble, which has an expected value of \$3,200. However, the vast majority of subjects were risk seeking by taking the gamble in the hopes that they could completely avoid a loss. A sure loss of \$3,000 is more traumatic than the potential loss of \$4,000.

Both of these experiments violate expected utility axioms. Kahneman and Tversky suggest that individual utility functions are concave in the domain of gains and convex in the domain of losses. They term this the “reflection effect.”²⁹ These curved functions are seen in Figure 1. Not only is the loss curve steeper, as previously discussed, but it is convex; the gains function is concave.

²⁸ Kahneman and Tversky, “Prospect Theory,” 268.

²⁹ Kahneman and Tversky, “Prospect Theory,” 268.

c. *Loss Aversion and the Endowment Effect*

People treat gains and losses differently in that “losses loom larger than gains,” which produces different risk orientations for losses or gains.³⁰ Simply, the pleasure of finding \$20 is less than the pain of losing \$20. This explains an individual’s loss aversion and a preference for the status quo, instead of a symmetric (50/50) bet of winning or losing the same absolute value (e.g., win \$1,000 or lose \$1,000).³¹ Called the “status quo bias” in economics and other fields, it is perhaps better to refer to this phenomena as a “reference point bias” when utilizing it in the field of international relations, as the status quo may not be a state’s chosen reference point.

People also value what they already possess more highly than comparable things they do not have—actually possessing the item adds value to it.³² The endowment effect is this “over-evaluation of current possessions.”³³ The effect presents problems for utility theory because preferences between A and B could reverse, simply because A may be part of one’s endowment. Also, the length one possesses a good and the difficulty or effort required to acquire it increases its value to the owner.

d. *Framing*

Framing can be considered the identification of the reference point. The information one uses to create their entering position into the decision affects how they will view the decision—from a loss frame or a gains frame. Thus, framing the choice becomes a critical part of prospect theory, particularly in cases of bargaining, where outsiders or competitors may want to influence a decision by managing, or even manipulating, how a decision is framed.

³⁰ Kahneman and Tversky, “Prospect Theory,” 279.

³¹ Levy, “Loss Aversion, Framing, and Bargaining,” 181.

³² Another way to view this effect is people often will not sell an item they own for a price they would not even consider buying it at. See, Jack L. Knetsch and J. A. Sinden, “Willingness to Pay and Compensation Demanded: Experimental Evidence of an Unexpected Disparity in Measures of Value,” *The Quarterly Journal of Economics* 99 no. 3 (1984): 507–521.

³³ Levy, “An Introduction to Prospect Theory,” 175.

In an illustrative example, Tversky and Kahneman found a reversal in preferences for an identical decision due to framing—whether it is was positive or negative.³⁴ Subjects were asked to choose between two medical responses for a disease outbreak that was expected to kill 600 people. The first group was asked if they preferred option A, which would save 200 people, or option B, which had a one-third chance to save all 600, but a two-thirds chance that all 600 would die. A vast majority, 72 percent, chose the conservative option of saving 200 people. The second group of subjects was asked essentially the same question, but framed negatively. In option A, 400 would die. Option B, however, had a one-third chance all 600 could be saved. A strong majority of 78 percent chose the gamble—the riskier option. In the domain of gains (saving lives), people were risk averse and chose the guaranteed outcome of saving 200 lives; in the domain of losses (choosing who dies), people were risk seeking and selected the gamble that could result in the death of all 600.

This reversal in preferences was due to the subject group viewing the problem through either a gains frame (How many can I save?) or a losses frame (How many is my decision going to kill?). All options, regardless of framing, have an expected value of 200 living and 400 dying. However, the transitivity of preferences was violated based on how the question was presented, or framed. Expected utility fails in this area, but prospect theory has strong explanatory power. Whether an individual frames the decision in terms of gains or losses “has a significant impact on preferences despite the mathematical equivalence of the two choice problems.”³⁵

The process of framing a choice can become complicated, based how an individual responds to the situation, particularly if there is a succession of choices and an unclear status quo.³⁶ As political scientist Jack Levy summarizes:

³⁴ Tversky and Kahneman, “The Framing of Decisions,” 453.

³⁵ Levy, “An Introduction to Prospect Theory,” 177.

³⁶ As is often the case in international relations.

Is the reference point for each choice problem framed cumulatively with respect to one's asset position at the beginning of the series of choices, or with respect to one's asset position at each individual choice? A gambler who sustains a series of losses will be more inclined to be risk acceptant if he or she adopts the cumulative frame of the asset position at the beginning of the evening and attempts to recover losses, whereas one who uses current asset levels would be more risk averse. Someone on a winning streak, however, will be more risk averse if he or she frames the choice in terms of initial assets rather than total assets at the time of each new bet.³⁷

Key to framing is how quickly individuals accommodate to their gains or losses. Accommodating to losses creates risk aversion (feeling no need to recover sunk costs) and accommodating to gains creates risk seeking (to keep the gains recently acquired). How long it takes to renormalize to gains or losses has significant impact on framing the choice, particularly regarding strategic interactions. Both parties can be put into a domain of losses if one benefits at the other's expense. For example, the first party may accommodate to gains quickly and become risk seeking to protect them, while the second party has not accommodated to the loss and is risk seeking to regain them. This produces two risk-seeking parties in a domain of losses, a potentially volatile combination in international relations.

Kahneman, Knetsch, and Thaler have observed an "instant endowment effect," where greater value is assigned to an object as soon as it becomes a possession.³⁸ This implies that individuals become accommodated to gains more quickly than they accommodate to losses, and reinforces the dichotomy that may occur in strategic interactions with two differing reference points.

Although prospect theory does not have a formal theory of framing, it does suggest that it is influenced by the "norms, habits, and expectancies of

³⁷ Levy, "An Introduction to Prospect Theory," 177.

³⁸ Daniel Kahneman, Jack L. Knetsch, and Richard H. Thaler, "Experimental Tests of the Endowment Effect and the Coase Theorem," *Journal of Political Economy* 98 no. 6 (1990): 1342.

decision makers.”³⁹ Unlike rational choice models, prospect theory is both historical and contextual when dealing with international relations, and reference points will reflect the experiences and expectations of the decision makers and the type of problems they face.⁴⁰

e. Certainty Effect

People overweigh outcomes that are certain relative to outcomes that are merely probable. Kahneman and Tversky have labeled this the “certainty effect,” and it produces outcomes that again violate expected utility. For example, when given the choice between option A: \$2,500 with probability .33, \$2,400 with probability .66 and \$0 with probability of .01; or option B: \$2400 with certainty, they found 82 percent of respondents chose option B, the certain outcome.⁴¹ This selection violates expected utility theory, which predicts an individual will maximize gains and select option A. Consequently, changes in probabilities near 0 or 1 have a greater impact on preferences than the same change in probability in the middle of the probability range (e.g., 0.5).

This effect implies a non-linear response to probabilities, contrasting the linear combination of utilities and probabilities in expected utility theory.⁴² As Levy succinctly states, “people attach greater value to the complete elimination of risk than to the reduction of risk by a comparable amount.”⁴³ Difficulty arises at the ends of the spectrum, where behavior may become unpredictable. As Kahneman and Tversky state:

Because people are limited in their ability to comprehend and evaluate extreme probabilities, highly unlikely events are either

³⁹ Janice Gross Stein, “International Co-operation and Loss Avoidance: Framing the Problem,” in *Choosing to Co-operate: How States Avoid Loss*, eds. Janice Gross Stein and Louis W. Pauly (Baltimore, MD: The Johns Hopkins University Press, 1993), 17.

⁴⁰ Stein, “International Co-operation and Loss Avoidance,” 18.

⁴¹ Kahneman and Tversky, “Prospect Theory,” 265.

⁴² Levy, “Prospect Theory, Rational Choice, and International Relations,” 91.

⁴³ Levy, “Prospect Theory, Rational Choice, and International Relations,” 91.

ignored or overweighted, and the differences between high probability and certainty is either neglected or exaggerated.⁴⁴

The certainty effect also interacts with the reflection effect, reinforcing risk-seeking or risk-avoiding behavior. Certain gains are overweighted, and induce greater risk avoidance; certain losses are also overweighted, inducing risk-seeking (gambling) behavior.⁴⁵

f. Isolation Effect

People often simplify the choice between two alternatives, and to do so they disregard shared attributes and focus on distinguishing features.⁴⁶ This approach produces inconsistent preferences because choices can be distilled into distinctive components in more than one way. Just like framing, the different decompositions of the choice can lead to different preferences.

Kahneman and Tversky clearly demonstrated the isolation effect, also called cancellation, with two sample problems. In the first, subjects were told, “In addition to whatever you own, you have been given 1,000.”⁴⁷ They then had the choice between option A: an additional 1,000 at 50/50 odds; or option B: a guaranteed additional 500. Eighty-four percent selected option B, the sure gain of 500. In the second problem, the subject group was told, “In addition to whatever you own, you have been given 2,000.”⁴⁸ The subjects then could choose option C: a loss of 1,000 at 50/50 odds; or option D: the certain loss of 500. Sixty-nine percent selected option C, the even bet of a 1,000 loss. Although when viewed as final end states, option A equals option C, and option B equals option D, individual preferences were reversed based on how the questions were decomposed. Specifically, the bonuses of 1,000 in the first problem and 2,000 in

⁴⁴ Kahneman and Tversky, “Prospect Theory,” 282–283.

⁴⁵ Levy, “Loss Aversion, Framing, and Bargaining,” 185.

⁴⁶ Kahneman and Tversky, “Prospect Theory,” 271.

⁴⁷ Kahneman and Tversky, “Prospect Theory,” 273.

⁴⁸ Kahneman and Tversky, “Prospect Theory,” 273.

the second problem were common to both prospects presented, and summarily ignored. This left the problems to be viewed as gains or losses, and the reflection effect came shining through.

3. Process

Prospect theory is broken into two phases, an editing phase, and a subsequent evaluation phase. Editing involves the initial analysis of the problem. Specifically, identifying the options, their associated outcomes and consequences, and the values and probabilities attached to each. It also includes the organization (or reorganization) of the problem to simplify evaluation. During the evaluation phase, the edited prospects are evaluated and the prospect with the highest value is chosen.⁴⁹ Kahneman and Tversky developed the formal model for evaluating prospects,⁵⁰ but the theory behind editing is less developed.⁵¹

a. Editing

The process of editing can be broken down into simpler elements, described below.

(1) Coding. The outcomes of prospects are coded as “gains or losses, rather than final states of wealth or welfare.”⁵² This coding is a result of the selection of the reference point and the framing of the outcomes as gains or losses from the selected point. As previously discussed, coding of the problem has significant impacts on which prospect is selected.

(2) Combination and Segregation. Prospects that have identical outcomes can have their probabilities combined. For example, a prospect of (500, .30; 500, .30) is combined to (500, .60), or a 60 percent chance

⁴⁹ Levy, “An Introduction to Prospect Theory,” 180.

⁵⁰ Kahneman and Tversky, “Prospect Theory,” 275–284.

⁵¹ See, Rose McDermott, “Prospect Theory in Political Science: Gains and Losses From the First Decade,” *Political Psychology* 25 no. 2 (2004): 304–305, for a state of the theory.

⁵² Kahneman and Tversky, “Prospect Theory,” 274.

of gaining 500. Similarly, riskless parts of prospects are segregated out, so the risky portion of the prospect can be evaluated. For example, the prospect of (300, .75; 400, .25) will be segregated into a sure gain of 300, and a 25 percent chance of an additional 100. The inverse, when dealing with losses instead of gains, is identical.

(3) Cancellation. A result of the isolation effect, cancellation during the editing phase results in individuals ignoring or discarding parts of prospects that are shared or common (such as the bonuses in the example given previously for the isolation effect). Another form of cancellation occurs with sequential decisions. Two prospects may have an identical first decision, which individuals often discard or ignore, and compare the prospects on the differences in the subsequent decisions. This is despite the fact that they would likely make a different choice if they factored in the common first decision.⁵³

(4) Simplification and Detection of Dominance. Probabilities can be rounded—and very unlikely ones even discarded—during simplification. For example, the prospect (101, .49) will likely be analyzed as (100, .50) and an outcome with probability of 0.000001 will likely be discarded. Prospects are also scanned for dominated outcomes, which are rightly rejected without further evaluation.⁵⁴

The sequence one uses to edit prospects can alter further editing, and therefore possibly the prospect selected. For example, a prospect may be simplified, which then creates a dominated—and therefore rejected—outcome that may have not been otherwise. The ambiguity in this area is a result of the weakness in the theory underpinning the editing phase of prospect theory. Kahneman and Tversky did not formulate a model, and one has not been presented to date.

⁵³ For an excellent example of how prospects can be decomposed in more than one way, see Kahneman and Tversky, "Prospect Theory," 271.

⁵⁴ Kahneman and Tversky, "Prospect Theory," 275.

b. Evaluating

After editing, an individual selects the prospect with the highest value, denoted V , which is comprised of two scales, a weighting function, π , and a value function, v .⁵⁵ The first scale, π , associates with each probability p , a “decision weight” $\pi(p)$. This “reflects the impact of p on the over-all value of the prospect.”⁵⁶ The second scale, v , assigns to each outcome x a value $v(x)$ “which reflects the subjective value of that outcome.”⁵⁷ The reference point serves as the zero for the value scale, therefore, v measures gains or losses from the reference point.

Kahneman and Tversky enumerated prospect theory into two equations, one for strictly positive or negative prospects (all outcomes are positive or negative) or one for regular prospects (those with outcomes that can be positive, negative, or zero). In the prospect $(x, p; y, q)$, one receives outcome x with probability p , outcome y with probability q , and nothing with probability $1 - p - q$, if $p + q \leq 1$. If $(x, p; y, q)$ is a regular prospect, then Equation (1) determines the value.⁵⁸

$$(1) \quad V(x, p; y, q) = \pi(p)v(x) + \pi(q)v(y)$$

The editing of strictly positive or negative prospects creates a different equation. Because the prospects are segregated into risky and risk-less components, there is a sure gain (or loss), and an additional gain (loss) that is at stake. If $(x, p; y, q)$ is strictly positive or negative, that is, $p + q = 1$, and either $x > y > 0$ or $x < y < 0$, then Equation (2) determines the value.⁵⁹

$$(2) \quad V(x, p; y, q) = v(y) + \pi(p)[v(x) - v(y)]$$

⁵⁵ This thesis will maintain Kahneman and Tversky's notation for prospect theory elements.

⁵⁶ Kahneman and Tversky, “Prospect Theory,” 275.

⁵⁷ Kahneman and Tversky, “Prospect Theory,” 275.

⁵⁸ Kahneman and Tversky, “Prospect Theory,” 276.

⁵⁹ Kahneman and Tversky, “Prospect Theory,” 276.

In Equation (2), it can be seen that the riskless component, $v(y)$, does not have a decision weight, $\pi(p)$, applied to it; instead it is applied to the risky component, which is the value difference $v(x) - v(y)$.

(1) The Value Function. Prospect theory's value function, v , has three main characteristics: it is defined on deviations from a reference point, rather than net position; it is concave for gains and convex for losses; and it is steeper for losses than it is for gains.⁶⁰ Therefore, it takes into account loss aversion, coding (i.e., reference dependence), and the reflection effect. Refer to Figure 1 for a hypothetical value function.

(2) The Weighting Function. In prospect theory, the value of each outcome is multiplied by a decision weight, π . In essence, π measures how desirable a prospect is based upon its probability. It is non-linear and has several characteristics. First, it is not well behaved near the endpoints. This reflects unpredictability of behavior with extremely small or large probabilities. Second, because $\pi(0) = 0$ and $\pi(1) = 1$, there is subsequently a sharp increase in the weighting function at the end points.⁶¹ This disproportionately affects the evaluation of prospects with high or low probabilities. Third, the slope of π is less than 1, except for small regions near the endpoints. This means the sum of decision weights to complimentary events are less than the weight given to a certain event (i.e., they are subadditive), which is reflected in the certainty effect. Finally, small probabilities are overweighted while larger probabilities are underweighted. This can be seen in the depiction of the weighting function in Figure 2, where probabilities below the 0.10 – 0.15 range have an increased (overweighed) decision weight.⁶²

⁶⁰ Levy, "An Introduction to Prospect Theory," 181.

⁶¹ As Kahneman and Tversky state, "outcomes contingent on an impossible event are ignored, and the scale is normalized so that $\pi(p)$ is the ratio of the weight associated with the probability p to the weight associated with the certain event." Kahneman and Tversky, "Prospect Theory," 280.

⁶² Levy, "An Introduction to Prospect Theory," 182–183.

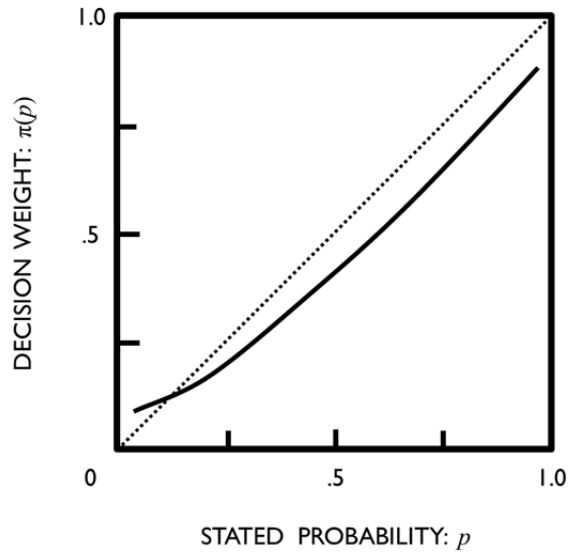


Figure 2. Hypothetical weighting function.⁶³

An example will best show how the value function and weighting function interact. Kahneman and Tversky found 72 percent of respondents preferred (5,000, .001) over (5). This implies,⁶⁴

$$\pi(.001)v(5,000) > v(5), \text{ hence,}$$

$$\pi(.001) > v(5) / v(5,000) > .001$$

This shows the overweighting of small probabilities, that is $\pi(p) > p$. Kahneman and Tversky also suggest that for all $0 < p < 1$, $\pi(p) + \pi(1-p) < 1$, hence the weighting function slope is less than 1 for most of its range.⁶⁵

When applying prospect theory to international relations, it is not sufficient to apply the S-shaped value function alone. It must be combined with the weighting function to determine risk propensities. Jack Levy writes about their integration:

⁶³ From Kahneman and Tversky, "Prospect Theory," 283.

⁶⁴ Kahneman and Tversky, "Prospect Theory," 281.

⁶⁵ Kahneman and Tversky, "Prospect Theory," 281.

In the domain of gains where perceived probabilities are above the transition point from overweighting to underweighting (where the weighting function crosses the 45 degree diagonal, at approximately $p = .10 - .15$), the underweighting of probabilities works together with the concavity of the value function to undervalue the gamble relative to the certain outcome, and thus to encourage risk aversion. In the domain of losses, the underweighting of probabilities (above the probability transition point) reduces the weights given to risky negative prospects, makes them less unattractive, and thus encourages risk seeking. In these probability ranges, the effects of the value function and the probability weighting function are thus mutually reinforcing.⁶⁶

Thus, not only must the value of a prospect be analyzed, but the weight assigned to its probability as well. This is particularly important for the areas of high and low probability. Unfortunately, this is also where it is most difficult to accomplish, due to the increased variance in the weighting function in these areas.

4. Integrating Prospect Theory into Territorial Disputes

The essence of territorial disputes changes over time based on the value and the nature of territory. Forsberg believes the strategic and economic value of territory is declining compared to years past, and that disputes generated by self-determination and historical ownership are becoming more current.⁶⁷ What has not changed, however, is each dispute is unique in its causes and solutions. Prospect theory provides a different framework than more traditional rational models to analyze territorial disputes. This alternative point of view may provide better insight into a dispute's genesis and possible conclusions. To this end, this section will integrate the principles and lexicon of prospect theory into territorial disputes.

⁶⁶ Levy, "An Introduction to Prospect Theory," 183.

⁶⁷ Forsberg, "Explaining Territorial Disputes," 439.

a. *Reference Point*

Defining the reference point for each participant in a territorial dispute is vital, as it is the foundation upon which prospect theory builds. Ideally, both parties would share an easily identifiable, common reference point, such as the status quo. However, states (or more precisely, their leaders) may use their aspirations or expectations to define their reference point.⁶⁸ This is likely when the status quo represents a loss of territory from a previous reference point that has not yet been accommodated.⁶⁹ Alternatively, states may quickly accommodate to a recent gain of territory and establish a new reference point from a position that the international community has not yet recognized as the status quo.

What the status quo does provide, however, is a starting point from which to analyze each state's options. Since it is the existing state of cartographic affairs, states have only two options: preserve it, or change it. If a state wishes to change the status quo, the degree to which it desires change is reflective of its dissatisfaction with the current situation. Therefore, highly unsatisfied states are likely to have a reference point far from the recognized status quo.

If a territorial dispute has a well-defined status quo and borders have been static for an extended period of time, then the status quo is a likely candidate as the reference point for both parties. However, as Levy states, "variations in the [selection of] reference points are particularly likely to arise in dynamic situations, where there is no well-defined and salient status quo that might serve as an obvious focal point for framing."⁷⁰ Unfortunately, prospect theory cannot predict the reference point that states are likely to select. However,

⁶⁸ Levy also acknowledges, "Social norms, and social comparisons... can influence the framing of the reference point." Levy, "Prospect Theory and the Cognitive-Rational Debate," 36.

⁶⁹ Stein, "International Co-operation and Loss Avoidance," 15.

⁷⁰ Levy, "Prospect Theory and the Cognitive-Rational Debate," 36.

reference points reflect “leaders’ experiences and expectations,” and through examination they can possibly be reconstructed to aid in the analysis of past decisions, or predict future ones.⁷¹

From whatever selected reference point, states will view their situation as either that of gains or losses. Because prospect theory predicts that a gains frame leads to risk-averse behavior, a territorial dispute is more stable if both parties are in a gains frame. Conversely, unstable disputes result when one or both belligerents are in a losses frame. Stable disputes are characterized by status quos that are tenable for both parties, but resolution may provide what can be seen as a loss for one party (be it territory, access to resources, or simply a historical claim). However, resolution can also possibly provide gains for both parties by removing the costs of conflict; the status quo bias is perhaps the culprit standing in the way of compromise in this case. How the territorial dispute is framed is instrumental in determining the reference point, and therefore the gains or losses frame. This is further discussed later in this section.

b. Reflection Effect

Once a state’s reference point is established, changes to it (because of open conflict or dispute resolution) will be viewed as losses or gains. Prospect theory predicts that states in a gains frame are risk adverse, and will be acceptant to a small loss in territory in order to avoid the possibility of a larger loss. Conversely, states in a losses frame are risk seeking and are willing to gamble a significant loss of territory for the possibility to make a gain. In actuality, a state in this frame likely does not view the prospect as making a gain, but more likely as recovering a former loss. This can provide explanations why weaker nations will enter armed conflict with an overly powerful opponent (e.g., Argentina

⁷¹ Stein, “International Co-operation and Loss Avoidance,” 18.

and the United Kingdom in the 1982 Falklands/Malvinas conflict).⁷² The reflection effect underscores the importance of determining a state's reference point if prospect theory is going to be useful in analyzing a state's actions regarding a territorial dispute.

It is important to note that, while a border dispute is typically a zero-sum game cartographically, it should not be limited to being framed in such a restrictive condition.⁷³ That is to say, it is possible for both belligerents to be in a gains frame or for both to be in a losses frame. A gain of territory for one (implying a loss of territory from the other) does not mean a gains frame for one and a loss frame for the other. The reflection effect can work to both sides' benefit or detriment, depending on how frames align. Simply because one state may gain territory does not place the other state in a domain of loss.

c. Endowment Effect

Territory inherently lends itself towards conflict. It is easily viewed as something possessed, and has inherent value for multiple reasons (e.g., resources, populations, markets, strategic access, nationalism, etc.).⁷⁴ Territory is also something that armies for millennia have known how to defend against loss. Simply put, the sense of ownership is strong. The endowment effect, therefore, is influential in territorial disputes. It affects judgments of what is fair and just, as the adage "possession is nine-tenths of the law" attests. Supreme Court Justice Oliver Wendell Holmes said it eloquently:

It is in the nature of man's mind. A thing which you have enjoyed and used as your own for a long time, whether property or an

⁷² Prospect theory can do much to explain actions taken by the governments on both sides of this South Atlantic war, particularly if both viewed the situation from a losses frame. It can provide answers to many of the questions raised by Arquilla and Rasmussen, such as, "[T]he puzzle of why Argentina's military first agitated for war and then, when conflict appeared imminent, opted to fight while withholding their key assets safe from harm." John Arquilla and María Moyano Rasmussen, "The Origins of the South Atlantic War," *Journal of Latin American Studies* 33 no. 4 (2001): 760.

⁷³ See, Forsberg, "Explaining Territorial Disputes," 438–439.

⁷⁴ Karen A. Rasler and William R. Thompson, "Contested Territory, Strategic Rivalries, and Conflict Escalation," *International Studies Quarterly* 50 no. 1 (2006): 146–147.

opinion, takes root in your being and cannot be torn away without your resenting the act and trying to defend yourself, however you came by it. The law can ask no better justification than the deepest instincts of man.⁷⁵

The endowment effect thus factors significantly into a state's view of a border dispute. Any territorial concession that a state may give as part of bargaining will be viewed as more valuable by the giving state than by the receiving state. It also gives heavy weight towards using the status quo as a starting point for any territorial dispute resolution, despite what reference points other states may hold (e.g., aspiration levels). The legal implications of the endowment effect are also relevant, particularly with *uti possidetis juris* and *uti possidetis facto*.

d. Certainty Effect

The certainty effect, combined with the reflection effect, produces risk-seeking behavior in territorial disputes. Specifically, a state may view inaction on their territorial claim as a sure loss. Prospect theory predicts this certain loss will be outweighed, and if the state is in a losses frame, gambling behavior is expected. Therefore, rather than remaining inactive, states in a losses frame would risk a larger loss of territory in open conflict (so long as there is a possibility of a gain) than take a sure, albeit small, loss. This type of undesirable situation can be skirted if the conflict is framed properly on both sides. In this case, if a state does not view its position as being “inactive,” the negative implications of the certainty effect can be avoided.

e. Isolation Effect

Because territorial disputes can be decomposed in different manners (e.g., based on territory size, population, resource wealth, etc.), the isolation effect must be considered for dispute resolution. Specifically, how the dispute is decomposed can affect how a state views the situation—from a losses

⁷⁵ Oliver Wendell Holmes, “The Path of the Law,” *Harvard Law Review* 10 no. 8 (1897): 477.

frame or a gains frame. When bargaining options are constructed, including concessions and grants, the isolation effect will cause states to simplify the choices, disregarding shared attributes. For example, if an option is presented in which both states will divide an attribute equally (e.g., a claim to a lake), that attribute will likely be ignored in order to focus on areas where the presentations differ. Because this thesis hypothesizes disputes are most arbitrable when both states are in a gains frame, options should be framed so that states are not aggregating—and thus disregarding—gains as much as possible.

f. *Framing*

Framing a choice for an individual in a laboratory experiment is relatively easy compared to framing a series of decisions a nation's leader(s) must make regarding a territorial dispute. Despite prospect theory's weak underpinning in this area, the endeavor must be attempted in order to utilize the theory's explanatory power.

Boettcher divides framing into three specific elements of a choice, "The actor's perception of the alternative courses of action, the outcomes associated with those alternatives, and the probabilities associated with particular outcomes."⁷⁶ These elements will be useful for the analysis of a state's framing, and particularly for properly framing choices for an arbitrated solution. This thesis hypothesizes that disputes are most arbitrable when both states are in a gains frame. As such, and in order to aid negotiations, the focus should not be:

...on what has been lost or what can be gained, but rather on how to prevent future losses with a treaty. Agreements should be framed not only in terms of how peace represents a positive gain, but also in terms of how it prevents further loss of life and property.⁷⁷

⁷⁶ William A. Boettcher III, "The Prospects for Prospect Theory: An Empirical Evaluation of International Relations Applications of Framing and Loss Aversion," *Political Psychology* 25 no. 3 (2004): 333.

⁷⁷ McDermott, "Prospect Theory in Political Science," 299.

McDermott argues context is a key factor in determining a state's domain (whether it is gains or losses). Context incorporates not only the situation and circumstances of the moment, but also the history of the event, the actors, and the trajectory.⁷⁸ All of these can be researched and analyzed in a territorial dispute.

Many of the cognitive effects described previously are intertwined with framing; that is, they either influence it or are influenced by it. In order to limit some of the negative effects of these principles, the notion of a bargaining chip is valuable. This is particularly useful in tempering loss aversion and the endowment effect. Without the notion of a bargaining chip, a concession can be viewed as a loss, and the compensation received from the other party as a gain. If these exchanges are on par, the endowment effect makes a state's concession more valuable than the compensation it receives, and it is therefore unsatisfied. Kahneman, Knetsch, and Thaler have dubbed this "concession aversion."⁷⁹

However, the same researchers also note that loss aversion and the endowment effect do not affect all trading, such as "normal commercial transaction[s]."⁸⁰ This is fundamental to the use of a bargaining chip. As Levy writes,

This implies that if concessions involve a "bargaining chip" and especially if the "chip" was acquired or created with that purpose in mind, the asymmetry of value attached to concessions given and compensation received is likely to be much less, so that the likelihood of a successful compromise would be larger.⁸¹

Therefore, framing—when possible—territory, resources, access routes, etc., as a bargaining chip will help create an environment that can keep

⁷⁸ McDermott, "Prospect Theory in Political Science," 300.

⁷⁹ Kahneman, Knetsch, and Thaler, "Experimental Tests," 1345.

⁸⁰ Daniel Kahneman, Jack L. Knetsch, and Richard H. Thaler, "Anomalies: The Endowment Effect, Loss Aversion and Status Quo Bias," *The Journal of Economic Perspectives* 5 no. 1 (1991): 200.

⁸¹ Levy, "Loss Aversion, Framing, and Bargaining," 187.

the dispute parties in a dual-gains frame, and possibly reach a non-violent, arbitrated resolution.

Before getting to arbitration, however, this thesis postulates that both states need to be in a gains frame. This will obviously not include all territorial disputes. Conflicts characterized by irredentism and sub-national ethnic groups are easily framed with emotional supports, and leaders may even desire a domain of losses to define their cause. It is hypothesized that arbitration will not produce an acceptable or enduring resolution for these cases.

5. Prospect Theory Summary

Prospect theory provides unique explanations for failures in expected utility theory, in that individuals ultimately view their decisions as gains or losses from a chosen reference point. Transferring prospect theory into international relations, specifically territorial disputes, allows this thesis to analyze states' framing of disputes, ideally determining which disputes have the potential to be resolved non-violently through arbitration.

B. NASH ARBITRATION

1. Introduction

In 1928, John von Neumann published the fundamental theorem of two-person, zero-sum games.⁸² From this mathematical foundation, von Neumann and Oskar Morgenstern published the seminal *Theory of Games and Economic Behavior* in 1944.⁸³ From here, game theory—a mathematical theory of conflict—developed rapidly and spread to many disciplines, particularly the social sciences.

Straffin describes game theory as “the logical analysis of situations of conflict and cooperation,” and specifically defines a game as situations in which:

⁸² J. v. Neumann, “Zur Theorie der Gesellschaftsspiele,” *Mathematische Annalen* 100 no. 1 (1928): 295–320.

⁸³ John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (Princeton, NJ: Princeton University Press, 1944).

- i) There are at least two *players*. A player may be an individual, but it may also be a more general entity like a company, a nation, or even a biological species.
- ii) Each player has a number of possible *strategies*, courses of action which he or she may choose to follow.
- iii) The strategies chosen by each player determine the *outcome* of the game.
- iv) Associated to each possible outcome of the game is a collection of numerical *payoffs*, one to each player. These payoffs represent the value of the outcome to the different players.⁸⁴

Game theory studies how players should rationally play these games to achieve the largest payoff possible. Of course, one player's choice is only part of the game. The opposite player(s) has strategies to choose as well, and may base theirs on choices they presume their competition may make. This strategic interaction is the heart of game theory.

As one way to solve a game, players can “[sit] down together to decide what is a reasonable or fair outcome to the game, and then [agree] to implement that outcome.”⁸⁵ This essentially is arbitration. This process allows the players to achieve results that are perhaps better (i.e., both receive higher payoffs) than if they were playing the game non-cooperatively or without communication. Von Neumann and Morgenstern held that any reasonable arbitrated solution for a non-zero-sum game should be both Pareto optimal and above each player's security level (i.e., what they could guarantee themselves with non-cooperative play).⁸⁶

⁸⁴ Straffin, *Game Theory*, 3. Italics in original text.

⁸⁵ Straffin, *Game Theory*, 102.

⁸⁶ John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior*, 2nd ed. (Princeton, NJ: Princeton University Press, 1947), 262. All subsequent citations refer to this edition.

Mathematician John Nash proposed such a solution in 1950.⁸⁷ He abstracted a two-person bargaining situation in order to create a mathematical model that provides a solution, or value, for each party.⁸⁸ Each person's utilities for possible outcomes are plotted on a coordinate plane that graphically represents a feasible region of outcomes, or a "payoff polygon." The polygon, by definition, is "compact and convex," bounding all outcomes to the problem.⁸⁹ Within the polygon is a status quo point, a default payoff both parties receive if they fail to negotiate (or simply do not play). Payoffs above the status quo values are considered the "negotiation set," and bargaining or arbitration seeks to maximize these payoffs for each party.

2. Axioms

Nash's bargaining scheme is based on four axioms that he believed a reasonable scheme should satisfy. It ultimately produces a single solution, N , that provides the best outcome for both players.

Axiom 1: Rationality. The solution point should be in the negotiation set.

Axiom 2: Linear Invariance. If either player's utilities are transformed by a positive linear function, the solution point should be transformed by the same function.

Axiom 3: Symmetry. If the polygon is symmetric about a line through the status quo with a slope of +1, the solution point should be on this line.

Axiom 4: Independence of Irrelevant Alternatives. If a payoff region that does not contain the solution is deleted but the status quo point remains the same, then the solution should remain the same.⁹⁰

These axioms are graphically displayed with payoff polygons in Figure 3.

⁸⁷ John F. Nash, Jr., "The Bargaining Problem," *Econometrica* 18 no. 2 (1950): 155–162. For additional arbitration solutions, see James D. Morrow, *Game Theory for Political Scientists* (Princeton, NJ: Princeton University Press, 1994), and Anatol Rapoport, *N-Person Game Theory: Concepts and Applications* (Mineola, NY: Dover Publications, Inc., 2001).

⁸⁸ Nash defines a value as "a set of numbers which depend continuously upon the set of quantities comprising the mathematical description of the game and which express the utility to each player of the opportunity to engage in the game." Nash, "The Bargaining Problem," 157.

⁸⁹ Nash, "The Bargaining Problem," 158.

⁹⁰ Straffin, *Game Theory*, 104.

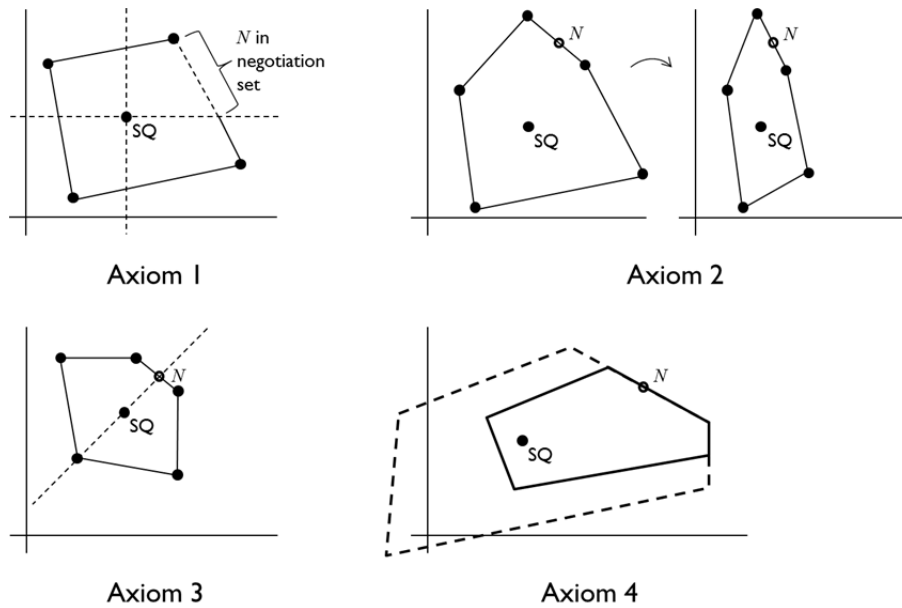


Figure 3. Nash axioms displayed with payoff polygons.⁹¹

3. Solution

Nash proves there is one, and only one, solution that satisfies all four axioms. That is, if $SQ = (X_0, Y_0)$, then the solution N is the point (X, Y) in the polygon with $X \geq X_0$ and $Y \geq Y_0$ that maximizes the product $(X - X_0)(Y - Y_0)$, as shown in Equation (3).⁹²

$$(3) \quad N = \text{maximize } (X - X_0)(Y - Y_0)$$

This calculation is relatively modest, as it simply maximizes each player's utilities from possible outcomes in the negotiation set (i.e., those above the status quo point). This leads to an important point—defining the status quo.

The influence of the status quo within Nash's scheme provides a strength for the purposes of this thesis, as it takes into account each player's strategic

⁹¹ From Straffin, *Game Theory*, 104.

⁹² Straffin, *Game Theory*, 105.

position with regards to their opponent. For example, the status quo may be defined as each player's security position (their payoff is secure, regardless of the other player's moves), or in more acrimonious cases, the status quo point may be determined by threat strategies (the other player's move reduces both player's payoffs) may be a more appropriate.⁹³

4. Implications

The solution provided by Nash provides each party with a payoff that should be considered fair, and the best they can expect given the strategic situation. For the power it holds, it is relatively easy to compute. However, translating this numerical value in terms of a utility function into tangible assets or other results is a challenge. For example, the arbitration scheme may determine that one player receives 4/7ths of a particular asset in dispute, but the asset may not lend itself to physical division. Similarly, if the asset can be physically divided, it may not be homogenous (such as territory in varying terrain), with some areas "better" or more valuable. Which 4/7ths does the party then receive, and who should determine this? The next chapter on modeling will discuss these challenges. Specifically, how a territorial dispute and the status quo can be modeled, both in terms of prospect theory to empirically determine arbitrability, as well as mathematically to permit Nash arbitration.

C. DRAWING HYPOTHESES FROM THE THEORY

This thesis's first hypothesis (*Applicability*) posits that disputes are most arbitrable when both parties are in the domain of gains. Prospect theory predicts each party will be risk adverse in this situation. It can be inferred that bargaining/arbitration is a more likely course than conflict escalation. As such, the resolution model presented in Chapter III attempts, where possible, to provide a positive framing of the conflict to each party in order to increase the

⁹³ Solutions utilizing security positions as the status quo (vice threat strategies) are sometimes referenced as "Shapley's solutions" or "Shapley's procedure," although they are based on Nash's four axioms. This thesis will refer to the axiomatic process as 'Nash arbitration,' regardless of status quo determination.

likelihood of an arbitrated solution. While an arbitration scheme can still be utilized to present a solution if one or more belligerents are in a domain of losses, it may be only an academic exercise, as the dissatisfied nation(s) may prefer resolution by other means (e.g., war).

The second hypothesis (*Acceptability*) suggests that the acceptability of Nash arbitration increases if each party is in a gains frame. This is due to the parity of the perceived gains of arbitration; one belligerent is not being taken advantage of. While acceptability should be inherent within Nash's axiomatic scheme (assuming both parties are cooperative and rational),⁹⁴ if states are not framing the conflict properly, arbitrated results may not appear acceptable. Again, the model presented in Chapter III maximizes the framing of gains to increase acceptability of the arbitrated results.

The third hypothesis of this thesis (*Durability*) predicts that disputes with conditions that produce the fewest aberrations to the game over time produce the longest lasting results. If the strategic positions of each player remain relatively constant and the negotiation space for arbitration is also relatively stable, then an arbitrated solution at one point in time is likely to be relevant at later dates. "Game changing" events would alter the strategic position the participants—thus the negotiation set—and the arbitrated solution would no longer be valid.

⁹⁴ Nash states, "Now since our solution should consist of rational expectations of gain by the two bargainers, ... there should be an available anticipation which gives each the amount of satisfaction he should expect to get." Nash, "The Bargaining Problem," 158.

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III. MODELING

A. INTRODUCTION

This chapter creates a territorial dispute resolution model utilizing prospect theory and Nash arbitration. To be manageable, the model abstracts the complex realities of conflicts into more defined and wieldy components. Analysis is then performed, results interpreted, and, ideally, an acceptable resolution to the dispute offered. The model first determines the default domain (gains or losses) of each party and presents alternative framing, if applicable, to increase the opportunity for successful arbitration. Next, a game is constructed that emulates the strategic position of each country within its domain. Third, an arbitrated result is computed utilizing Nash's axiomatic bargaining solution. Finally, this mathematical solution is translated geographically for implementation and resolution (Figure 4).

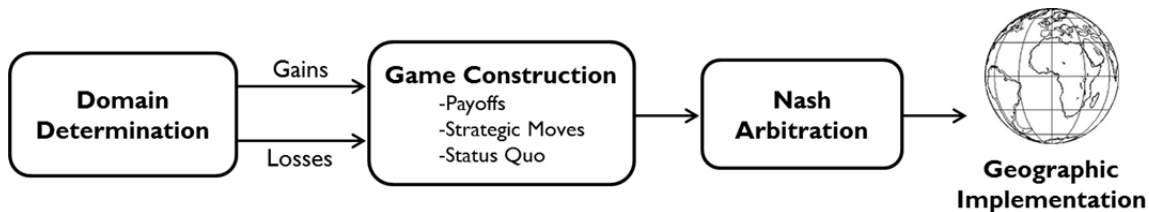


Figure 4. Dispute resolution model.

B. DOMAIN DETERMINATION

This thesis hypothesizes that disputes involving parties in a domain of gains are the most arbitrable. Determining the domain, therefore, is central to modeling the dispute. As prospect theory has its foundation in cognitive psychology, this is an empirical aspect of the model, whereas the remainder of the model (the arbitration scheme) will be more mathematical. Within this portion, the principles of prospect theory (particularly endowments, certainty, framing, and reference points) will help with the analysis of each party's outlook on the dispute, and justify the chosen domain.

1. Endowments

In analyzing a state's view of their endowments, current territorial possessions, borders, and/or lines of control provide a starting point. If these elements have not had a consequential change for some time (i.e., a few years), then the current state of affairs is the status quo for purposes of the model. If, however, the most current situation regarding the border is a result of a recent seizure, war, occupation, etc., then the current cartographic situation requires more analysis before it can be utilized as the model's status quo.

Analysis for a recently changed border or territorial control considers the frequency of change, the size of territory exchanged, and the method of exchange (e.g., war, coercion, treaty), as a minimum. For example, how often does the territory change hands? Is the occupation sustainable, or is it only a short term/seasonal expedition? Is the country on the losing end of the recent exchange capable of immediately regaining the lost territory? These sample questions help determine the fluidity of the dispute. If the conflict is highly fluid, then the current boundary is not the status quo. Instead, a status quo is created that grants each party the territory they consistently control, and the more fluid dispute area becomes a no-man's land that cannot affect either party's strategic position for purposes of the model. If neither party can maintain possession of the territory for a long enough period to remove fluidity from the conflict, then neither should have their strategic position enhanced by such a fleeting position.

When current possessions are not factored into the model's status quo, as in the example above, they are incorporated into each belligerent's endowment in other ways. The most obvious is as the state's reference point, which does not need to be the same as the status quo. Due to the instant endowment effect, a nation may use a very recent seizure of territory as their reference point. Alternatively, a nation may view territory that they do not control as theirs, and incorporate this aspiration level into their reference point (irredentist claims, for example).

While the status quo, aspiration levels, and the instant endowment effect may define the geographic outlines of a nation's reference point, there is more to consider. The length of time territory has been controlled or, alternatively, coveted, and the difficulty required in gaining or maintaining that control also factor into a state's endowment rationale. Hard-earned gains or long-term possessions are difficult to wrestle out of a country's endowment for purposes of determining their prospect-theory domain.

2. Certainty

Perceived certainty affects the weighting function in prospect theory. Specifically, outcomes that are certain are overweighed compared to those that are merely probable. When outcomes are overweighed, expected utility is often violated and behaviors based upon it appear unexpected. Factors outside of a state's control may affect how they view the certainty of particular events, complicating their decision making, and thus the modeling process. For example, state A may have a disputed area with an adjacent state B, and neither has militarized the territory. State A may view their inaction of defending the space as ceding it to State B, once B moves in with force. While it is not certain state B will ever move in and claim the disputed land (a factor outside state A's control), state A nevertheless sees their inaction as a certain loss. The domain determination aspect of the model accommodates belligerents that have events they perceive as certain, as this critical to properly framing the conflict.

3. Framing and Reference Points

Reference dependence is the essence of prospect theory; it is the pivot upon which changes in preferences occur. With a full understanding of the theory, it is clear how a case is framed determines the reference point, and therefore impacts the choices made. In other words, belligerents can change their reference point, and therefore their strategic position and options, by looking at the conflict from a different viewpoint.

For purposes of this model, a belligerent's default reference point is determined by analyzing how they can possibly frame the conflict. More specifically, whether the framing is positive or negative. This is accomplished by examining the leader's (or leaders') historical experience and expectations regarding both the dispute and other international relations, geopolitical factors, economic impacts, and other issues relevant to the dispute. These empirical answers are examined within the context of the theory in order to analyze the default framing of the decision maker(s).⁹⁵ If the default framing is deficient for successful arbitration, an alternative "arbitration framing" that highlights gains is proposed.⁹⁶ This alternative framing may place the party in a domain of gains, and ideally expand the negotiation set.

Each party's reference point is determined at different points in time within the conflict in order to determine how much the conflict, and therefore the arbitrated results, shift. This is key to determining the durability of Nash arbitration results. The mathematical portion of this model is conducted with each of the time-dependent reference points to determine how much N moves within the bargaining space. A stable N indicates a durable result.

C. THE GAME

1. Integrating Prospect Theory and Game Theory

Game theory relies on traditional rational models, like expected utility, to determine the payoffs (and therefore the choices made) in the game. Prospect theory, however, can create significantly different results within game theory due to preference reversals. In this case, a state's ordinal ranking of payoffs will differ from standards often used. For example, if given the option between "war" or

⁹⁵ The process may also incorporate other applicable factors that can influence a decision maker's framing, such as the 'availability heuristic,' which may overweigh otherwise inconsequential factors. See Amos Tversky and Daniel Kahneman, "Availability: A Heuristic for Judging Frequency and Probability," *Cognitive Psychology* 5 no. 2 (1973): 207–232. Analysis within the model also leverages the isolation effect to present disputing parties with a gain whenever possible, thereby preventing the aggregation and discounting of beneficial outcomes.

⁹⁶ In accordance with the first hypothesis, *Applicability*. This also implies a "new" reference point.

“peace” in a game, “war” may not be the worst outcome (as is often is with expected utility) for a country with reversed preferences. If payoffs are changed from ordinal to interval scaling, then preferences can become even more detailed and nuanced.

Take, for example, the classic game of chicken, shown in standard form in Figure 5.

		Driver B	
		Swerve	Don't Swerve
Driver A	Swerve	(3,3)	(2,4)
	Don't Swerve	(4,2)	(1,1)

Figure 5. Game theory version of chicken with ordinal payoffs.⁹⁷

With expected utility, the game has two equilibria and either player can improve his or her position with a first move. The low utility of Don't Swerve/Don't Swerve (resulting in a head-on collision) should keep the game out of that quadrant. However, payoffs for the game of chicken can be reversed according to prospect theory. For example, a driver in a domain of losses is risk acceptant. Depending on how the situation is framed, she may feel it is better to not swerve and regain her reputation, then to swerve and be ridiculed. This creates the game in Figure 6.⁹⁸

		Driver B	
		Swerve	Don't Swerve
Driver A	Swerve	(3,3)	(1,4)
	Don't Swerve	(4,2)	(2,1)

Figure 6. Chicken with changed payoffs due to preference reversal.

⁹⁷ For each outcome, the first number is the payoff to the row player, the second, to the column player. The higher the number, the more preferred the outcome: 4 = best, 1 = worst.

⁹⁸ This integration of prospect theory into game theory is based upon the unpublished work of Frank Giordano and Gordon H. McCormick.

It can be seen in Figure 6 that driver A has a dominant strategy to not swerve. Ideally, she has communicated this to driver B in some manner, particularly if driver B is in a domain of gains and is risk adverse. Altering payoffs in a manner consistent with the utilities of prospect theory creates a useful model; the change in payoffs creates a change in strategic moves, which in turn creates a change in outcomes. This alternative to expected utility may possibly provide better fidelity for dispute resolution.

2. Setting up the Game

Real-world conflicts and disputes are enormously complex. As mathematician and game theorist Phillip Straffin says:

It may be hard to say who the players are, it is usually impossible to delineate all the conceivable strategies and say what outcomes they lead to, and it is not easy to assign payoffs to any given outcome. The best we can hope to do is to build a simple game which *models* some important features of the real situation.⁹⁹

This model will abstract and simplify a complex territorial dispute by creating a two-person, non-zero-sum game. Communication between the players is obviously essential to an arbitrated resolution and will factor into the proposed solution. It is worth examining the game without communication, however, in order to determine the strategic strengths and weaknesses of each player.

It is important at this point to address the transitivity of preferences. It is understood that prospect theory accepts intransitive preferences as a result of switching domains from gains to losses, or vice-versa. However, game theory needs transitive preferences in order to determine player's strategies. This dilemma is solved by setting up a game in one domain only. That is, a game must specify which domain each player is in, and is applicable for that domain

⁹⁹ Straffin, *Game Theory*, 4. Italics in original text.

only. When each player remains in their domain, their preferences are transitive. Meaningful payoffs can therefore be assigned.¹⁰⁰

3. Payoffs

Game payoffs for a particular domain are first assigned values on an ordinal scale. This ranks outcomes from the most preferred to the least preferred, but it does not indicate the absolute or relative magnitude of the preferences. With ordinal scaling, dominated strategies and equilibria (if any) in the game are identified.

In order to proceed to an arbitrated solution, interval scaling must replace ordinal scaling. This allows cardinal payoffs that represent meaningful differences in the preferred outcomes. For example, with ordinal scaling it can only be determined that outcome x is preferred to y , which is preferred to z . That is, $x > y > z$. However, with cardinal utilities, it is possible to say that x is five-times more desirable than y , which is twice as desirable as z . That is, $10 > 2 > 1$. Here it is obvious that outcome x with a cardinal payoff of 10 is much more desirable to the player than either outcome y or z , with payoffs of 2 and 1. The latter two outcomes are nearly identical in their unpleasantness when compared to the most-preferred outcome.

The difficult proposition of assigning each player's payoff values is accomplished by analyzing their interests in the conflict. This analysis is similar to the previous analysis that determined each player's framing of the conflict, and will contain many of the same data points.

4. Strategic Moves

With payoffs assigned, the game can be played, or analyzed. Calculating the payoff for each party's possible decisions helps to understand their strategic position (i.e., strength) in the game. First moves, commitments, threats, and

¹⁰⁰ This idea is supported by the literature. See Levy, "Prospect Theory, Rational Choice, and International Relations," 93, for a review.

promises are analyzed to understand who holds the best strategic position and determine each player's best moves. For example, take the following traditional games of chicken (translated into seizing disputed territory) in Figures 7 and 8, with payoffs determined by expected utility. It is assumed each player knows the other's ordinal payoffs.

		Country B	
		Seize	Don't Seize
Country A	Seize	(1,1)	(4,2) Outcome
	Don't Seize	(2,4)	(3,3)

Figure 7. Country A makes the first move.

		Country B	
		Seize	Don't Seize
Country A	Seize	(1,1)	(4,2)
	Don't Seize	(2,4) Outcome	(3,3)

Figure 8. Country B makes the first move.

Each country has a strong incentive to seize the disputed territory first.¹⁰¹ If they do, under expected utility the other country will avoid war and not attempt to seize the territory back, escaping the worst-case outcome of (1,1).

However, payoffs assigned under prospect theory may not be the same as expected utility. Consider a game with both countries in a domain of losses. Each prefers to fight over the territory, so long as there is a chance to gain/maintain control of it. In this "prospect game theory," it is not assumed that players know

¹⁰¹ Or firmly defend the territory if they already possess it.

the other's domain, and therefore their payoffs. As in real life, each player must make an educated guess, and gamble with their decision. The Falklands conflict serves as an example in Figure 9.

		United Kingdom (loss domain)	
		Defend/ Retake	Don't Defend/ Retake
Argentina (loss domain)	Seize	(2,2)	(4,1)
	Don't Seize	(1,4)	(3,3)

Figure 9. Prospect game theory example.

Argentina may have assumed that the United Kingdom had payoffs more in-line with expected utility and the traditional game of chicken, and would avoid conflict. However, if the United Kingdom was also in a domain of losses and their payoffs mirrored the Argentineans, conflict is obviously on the horizon.

If the dynamics of the game do not permit first moves, commitments can generate similar results. For example, in the game of chicken (Figure 5), both players have an incentive to make the first move to achieve their best payoff (evidenced by Figures 7 and 8). However, Not Swerving is essentially not making a move, but maintaining the status quo of driving straight ahead. How does a player make the first move, if neither plan to move (swerve)? Driver A can make the commitment to not swerve and communicate this to Driver B. Driver B now sees that Driver A has essentially made the first move by communicating his strategy to the other player. Once Driver B sees Driver A remove the steering wheel and throw it out of the car, she knows Driver A is committed to not swerving. Driver B now must decide, based on her payoffs, is it better to swerve or not?

Threats can also change the strategic moves of a game and influence the outcome. Take the game in Figure 10:

		Colin	
		C	D
Rose	A	(4,3)	(3,4)
	B	(2,1)	(1,2)

Figure 10. A threat vulnerable game.

This game is solvable with an equilibrium at AD, which is also Pareto optimal. This outcome is reached regardless if Rose or Colin moved first or made commitments.¹⁰² However, due to the arrangements of payoffs, if Rose makes a threat to Colin she can change the moves of the game and achieve her best payoff. Rose can communicate to Colin, “If you choose D, then I will choose B.” If the threat is believed, then payoff AD is eliminated because Rose will not pick strategy A. Colin’s best choice between his remaining options of AC, BC, and BD is the payoff (4,3) at AC. This gives Rose her best payoff. Of course, it is critical that Colin believe Rose will carry out her threat.

However, Rose’s threat may be difficult to believe. Why would Rose intentionally reduce her payoff? Say Colin does chose strategy B, even with Rose’s previous threat. To carry out the threat, Rose must purposely reduce her payoff from 3 to 1, her least favorable outcome (while Colin is reduced from 4 to 2). This is very difficult in games that are only played once, but in games with multiple iterations, Rose’s strategy has a reward at the end. It is beneficial to take the loss in the short term in order to modify Colin’s choice to strategy A, which is more beneficial to Rose in the long term (her highest payoff). Territorial conflicts can obviously be modeled as games with multiple iterations. While it may be years or decades between iterations, they are no doubt played multiple times as

¹⁰² The players “Rose” and “Colin” are taken from Straffin, *Game Theory*, and help clearly identify the game’s players.

each state jockey for position. While not every game has payoffs that are susceptible to threat strategies, the proposed model accounts for threats when applicable.

A promise, like a threat, also alters the strategic play of a game. Take the classic game “prisoner’s dilemma” in Figure 11:

		Colin	
		C	D
Rose	A	(3,3)	(1,4)
	B	(4,1)	(2,2)

Figure 11. Prisoner’s dilemma, a game that benefits from a promise.

Both Rose and Colin have dominant strategies, putting the equilibrium for the game at BD with a payoff of (2,2). However, this is not Pareto optimal. Both could do better at AC with payoff of (3,3). How, then, can each player be motivated to play a dominated strategy, one that could easily be taken advantage of by the other player, giving them their worst outcome? A promise can move the players from their stable equilibrium to the Pareto optimal result: “If you chose A, I will choose C.”

Again, the believability of Rose’s promise is difficult because she must reduce her payoff. Colin could chose strategy C because of the promise, but Rose could betray him and select strategy B. This would give Rose her best payoff and Colin his worst, a tempting finish for competitive players. Again, repetitive play helps this situation. Rose only needs to betray Colin once and he will never again fall for her promises. Within international relations, many formal bodies (e.g., United Nations, treaty alliances) can enforce or apply credibility to promises. Like threats, not all games can benefit from promises (or the combination of a threat with a promise). The proposed model, however, will accommodate promises when available.

5. Security Positions

In any given game, it is possible to assume that a player will not choose a strategy that results in the highest payoffs to them, but rather a strategy that *minimizes* the other player's payoffs. This type of play is particularly useful in games with multiple iterations and if the undercutting player has ample resources. For example, if Country A is rich and powerful, they may play not to enhance their payoff, but to reduce Country B's payoff. If Country B does not have the resources to outlast Country A's onslaught, they may stop playing the game altogether. With the victory, Country A can now halt their costly threatening strategy and reap the spoils of Country B abandoning the game (territory). With such a game possible, Country B has the option to play its prudential strategy. This strategy gives B the best payoff possible, regardless of the moves A makes against it. This payoff is Country B's security level

The proposed model incorporates security levels as possible results if negotiations break down. As discussed previously, not all territorial disputes have a clear or stable status quo. Particularly acrimonious cases may have belligerents employing costly threat strategies in order to improve their strategic position (e.g., the cost to the People's Republic of China to garrison military forces on desolate islands in the South China Sea are higher than the benefits they receive in the short-term).

In summary, to model a territorial dispute as a game, each party's domain must first be determined via a chosen reference point. A status quo point is then selected based upon the fluidity of the conflict. This leads to the assignment of payoff values for each country's different strategies. Payoffs are simplified to an ordinal scale to determine each nation's strategic strengths regarding first moves, commitments, threats, and promises. After this process, ordinal values are replaced with cardinal payoffs and arbitration can begin.

D. ARBITRATION

After a domain-incorporating game is created that emulates the strategic position of each country, arbitration is performed to provide each nation an acceptable payoff to resolve the dispute. This model uses the axiomatic approach of Nash's bargaining solution.

1. The Status Quo

As discussed earlier, the status quo for the model is determined by one of two methods. For stable disputes, it is the current cartographic conditions (e.g., lines of control). For unstable disputes, the status quo is determined by assigning each nation the territory they consistently control, and transient territory is placed in an unclaimed, no-man's land. Both of these status quos may be susceptible to threats (depending on dispute conditions) if negotiations break down. These threat strategies can result in a stronger strategic position within the game for one country. Therefore, security levels, vice the determined status quo, may be used in Nash arbitration for these types of disputes.

The status quo, regardless of how it is determined, is assigned a payoff value of zero for each country. Gains from the status quo are assigned positive payoffs; losses receive negative payoffs. Security positions (unless they are also the status quo) receive negative payoffs, as they are losses from the status quo due to a credible threat. It is important to note that even though the status quo is assigned a payoff of zero, it may still be a costly—if not an untenable—position for a nation, a position that would normally correlate with a negative payoff. However, as prospect theory's reference dependence requires deviations from a point, zero is chosen for ease of use.¹⁰³

¹⁰³ The reference point for domain determination is not necessarily tied to the status quo, however. Also, as an arbitrary value, the status quo may be assigned values other than zero if necessary.

2. A Cooperative Solution

When creating and analyzing the territorial dispute game above, many conditions are examined: playing without communication, playing to minimize the other nation's payoff, executing threats, etc. However, drawing from this thesis's first two hypotheses (*Applicability* and *Acceptability*), it is assumed that nations in arbitration will play cooperatively and with communication. That is, they will agree what is a fair outcome to the dispute and implement it.

For a hypothetical dispute, Romania (the row player) and Colombia (the column player) are contesting territory. Both have militarized the line of control (at continued great cost), and each makes a claim beyond the line of control. However, both countries have grown ambivalent, if not amicable, towards each other over the years, and they find their economic and cultural relationship valuable.

With initial analysis, Romania and Colombia's default framing of the dispute may not reflect their overall inter-connectedness. They may focus on symbolic or emotional specifics of the dispute, perhaps as a means for an internal political end. This could place one, or both, of the nations in a domain of losses with respect to the dispute. Instead of looking at the broader context of economic, cultural, and regional effects, the countries focus on the zero-sum aspect of controlling terrain. Figure 12 displays payoffs for such a perilous situation.

		Colombia (Losses)	
		Seize	Abandon
Romania (Losses)	Seize	(-5,-3)	(10,-10)
	Abandon	(-10,10)	(-1,-2)

Figure 12. Hypothetical Romania-Colombia territorial dispute game (losses).

In this game, the status quo has both countries maintaining the line of control and is assigned a relative payoff of (0,0). Both Romania and Colombia

view abandoning their claim as zero-sum. Unilateral abandonment is also viewed as more costly than both open conflict and maintaining the status quo. This is not desirable, as both countries are risk acceptant because of their domain of losses. Assigned payoffs favor conflict over negotiations (and the possible resulting concessions). Plotting the payoffs into a polygon (Figure 13) shows the difficulty of the situation, as there is no Pareto-optimal move away from the status quo; a negotiation set does not exist.

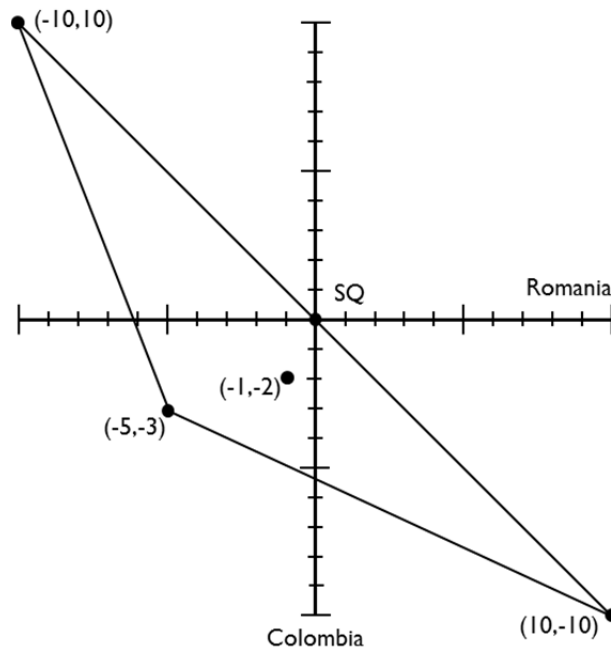


Figure 13. Payoff polygon for Romania-Colombia game (losses).

Framing the conflict in broader terms than zero-sum control over terrain has the potential to change the domain of the belligerents, and therefore their payoffs. With altered payoffs, peaceful alternatives may become acceptable.

For example, an arbitrator could highlight the economic potential of the undeveloped, disputed terrain. Both Romania and Colombia could benefit from development, regardless of who controls the land. In addition, conflict over the disputed border may worsen other, more consequential, regional geo-strategic factors. A gain in territory may be a small prize for upsetting regional stability. If

Romania and Colombia alter their framing to incorporate other germane factors, they could create a domain of gains and not seek open conflict over the territory. Rather, they could pursue arbitration with the hopes of reducing the costs of maintaining the disputed line of control.¹⁰⁴

Take the game in Figure 14, a dispute with Romania and Colombia now in a domain of gains:

		Colombia (Gains)	
		Seize	Abandon
Romania (Gains)	Seize	(-9,-6)	(8,-4)
	Abandon	(-3,10)	(2,1)

Figure 14. Hypothetical Romania-Colombia territorial dispute game (gains).

In this game, both countries are risk adverse because of their domain. With successful arbitration more likely, the dispute is further analyzed.

The status quo has both countries maintaining the stable line of control and is assigned a relative payoff of (0,0). Comparatively speaking, it is more difficult and costly for Romania to maintain the dispute than it is for Colombia, as reflected within each country's cardinal payoffs.¹⁰⁵ Both countries can receive their highest payoff of if they seize without contest. However, if one seizes, the other country may seize as well, not a desirable prospect for a risk-adverse country.

To analyze first moves, commitments, threats, and promises, cardinal payoffs are simplified to an ordinal scale, producing the game in Figure 15.

¹⁰⁴ This example is, of course, overly simplistic, but serves to highlight the importance and dynamic nature of framing.

¹⁰⁵ This is determined by analyzing the payoff ratios within each country's scheme, not by 'interpersonal' comparison of utilities, which is meaningless (i.e., Romania does not value a 10 the same as Colombia values a 10). The ratio of payoffs to the status quo shows that events (e.g., conflict, maintaining the border) are generally costlier for Romania.

		Colombia (Gains)	
		Seize	Abandon
Romania (Gains)	Seize	$(-2, -2)$	$(2, -1)$
	Abandon	$(-1, 2)$	$(1, 1)$

Figure 15. Ordinal scaling for Romania-Colombia game.

From the ordinal scale game, a movement matrix for each country determines dominated strategies and equilibriums, if any (Figure 16).

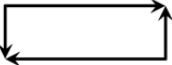
		Colombia (Gains)	
		Seize	Abandon
Romania (Gains)	Seize		
	Abandon		

Figure 16. Movement diagram for Romania-Colombia game

Neither country has a dominant strategy. While there are two equilibria, they are non-equivalent and non-interchangeable due to the non-zero-sum nature of the game. If both players try for their favored equilibrium (simultaneously and without communication), they will end up at Seize/Seize, the least desired outcome for both.

Both countries do have a first move available: seizing the territory. This ideally results in the other country abandoning their claim. However, as described previously, integrating prospect theory creates ambiguity for the seizing country in this situation. Is the other country in a domain of losses and willing to fight? If the seizing country is in a domain of gains, they will likely avoid the risk of conflict and choose not to seize, despite their first-move advantage.

The same context is true for the threat available to each country (i.e., “If you seize, I will seize”). If the threat is communicated and believed, the

threatening country could receive its highest payoff, with the other country abandoning its claim. However, a country in a domain of gains is not likely to threaten the other nation; if the threat recipient is in a domain of losses, the risk of conflict escalates (refer to Figure 6). A risk-adverse nation, therefore, should not issue the threat.

If both countries play their conservative “maximin” strategy, they end up at Abandon/Abandon with a payoff of (1,1).¹⁰⁶ While not their highest payoff, it is better than the status quo, as they are relieved of the costs of maintaining the dispute. Conservative play fits nicely if both nations are risk adverse, but surely they could increase their payoff if they communicated, instead of both unilaterally abandoning their claims outright. Arbitration is a logical solution to this dispute.

a. Graphical Nash Solution

The possible outcomes to the dispute are graphically represented by constructing a payoff polygon¹⁰⁷ (Figure 17).

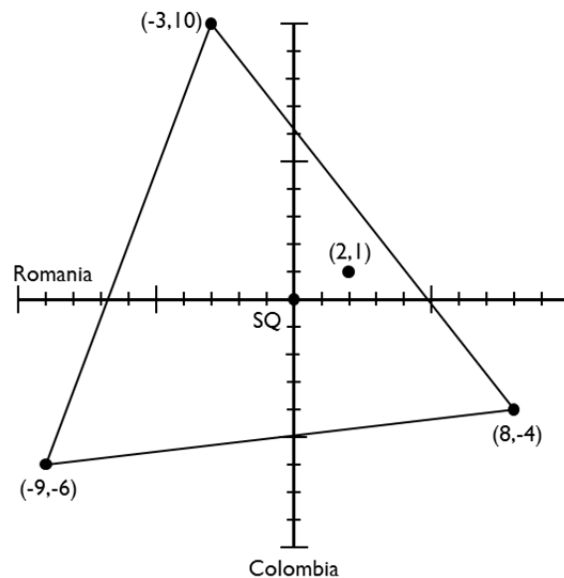


Figure 17. Payoff polygon for Romania-Colombia game.

¹⁰⁶ This is also the same outcome if both a threat and promise are used in combination.

¹⁰⁷ Which provides visual proof that the countries can do better than their mutual abandonment position at (2,1).

From the bounded and convex payoff polygon, a triangle is drawn from the status quo point to the Pareto optimal line $[(-3,10) \text{ to } (8,-4)]$. This ensures each country will do no worse than the status quo by bounding the Pareto optimal outcomes. This defines the negotiation set (Figure 18).

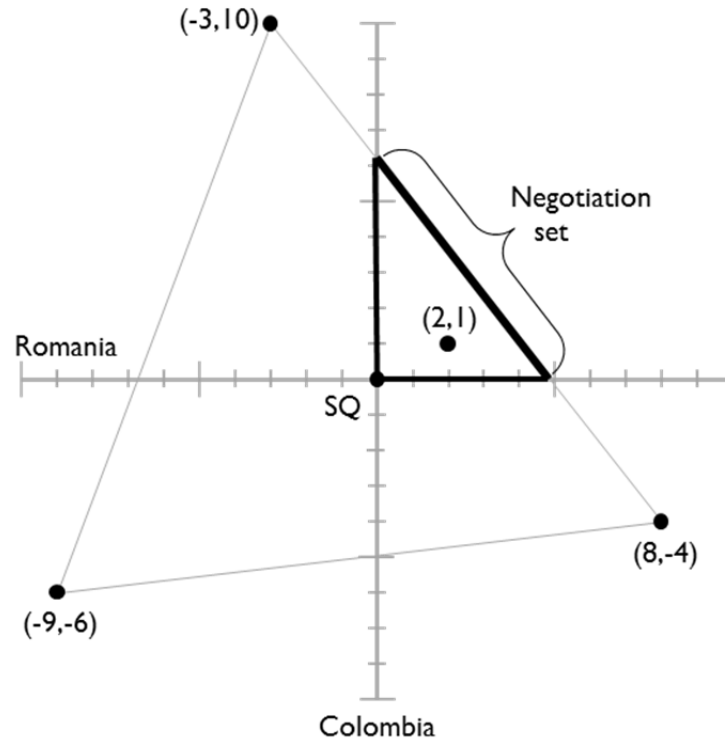


Figure 18. Negotiation set for Romania-Colombia game.

Within the negotiation set lies the point N , which both countries should find as a satisfying payoff to resolve their dispute. It is found graphically by halving the x - and y -axis of the negotiation triangle. The corresponding intersection on the Pareto optimal line is Nash's axiomatic solution (Figure 19).

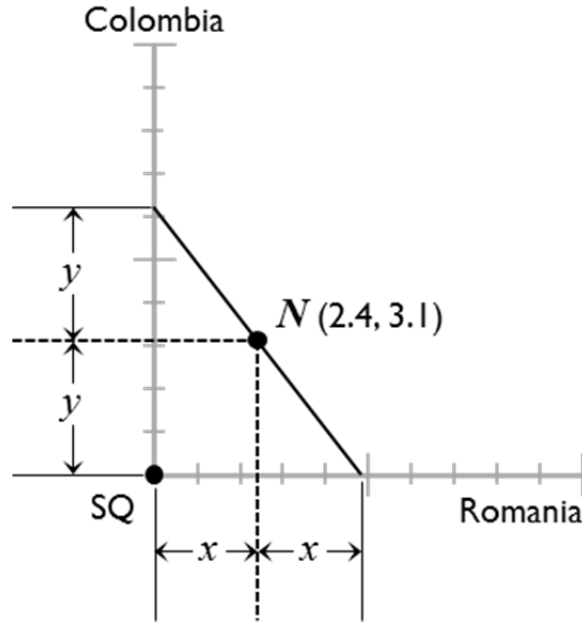


Figure 19. Graphical Nash solution for Romania-Colombia game.

It is graphically determined that N is $(2.4, 3.1)$. Each country should be satisfied with their payoff: it is better than maintaining the status quo at $(0,0)$, and also provides a better solution than conservative play at $(2,1)$.

b. Algebraic Nash Solution

The Nash point is calculated algebraically using Equation (4):

$$(4) \quad (X_o + a/2|m|, Y_o + a/2)$$

Where (X_o, Y_o) is the "status quo,"¹⁰⁸ a is the height of the Nash triangle, and m is the slope of the Pareto optimal line. Both a and m must be determined before Equation (4) can be completed.

The equation for the Pareto optimal line from point $(-3,10)$ to $(8,-4)$ is $y = mx + b$, where b is the y -intercept. Then,

$$m = (Y_2 - Y_1) / (X_2 - X_1) = (-4 - 10) / (8 - -3) = -1.27$$

¹⁰⁸ Using the standard terms of Nash arbitration. It may actually be the threat positions of the belligerent countries, depending on the dispute.

Then,

$$b = Y_I - mX_I = 10 - (-1.27)(-3) = 6.18$$

Therefore, the Pareto optimal line is:

$$y = -1.27x + 6.18$$

Next is the calculation for the height of the Nash triangle, a , which is the y -value difference between the intersection of the Pareto optimal line at X_o and Y_o . It is straightforward in this example, as (0,0) is utilized as the “status quo.” However, for disputes that do not use the current status quo for arbitration (e.g., a threat position if negotiations break down), the process is as follows:

Let Y_i be the y -value of the Pareto intercept of X_o . Then,

$$Y_i = mX_o + b = -1.27(0) + 6.18 = 6.18$$

Since,

$$Y_i - Y_o = a$$

Then,

$$a = 6.18$$

With a and m determined, substitution into Equation (4) produces the Nash point:

$$\begin{aligned} X_{Nash} &= X_o + a/2|m| = 0 + 6.18/2(1.27) = 2.43 \\ Y_{Nash} &= Y_o + a/2 = 0 + 6.18/2 = 3.09 \end{aligned}$$

Therefore,

$$N = (2.43, 3.09)$$

E. GEOGRAPHIC IMPLEMENTATION

The result of Nash arbitration provides each nation with a payoff value they should deem fair. However, translating a payoff integer into territory is a difficult process. The difficulty is further compounded because the game is not zero-sum. It is possible, in fact likely, for both countries to gain from the status quo. How is territory divided if both are rewarded with gains?

It is worth noting again that the payoff values incorporate more than just physical control over terrain. Framing the conflict not only influenced a nation's domain, it also parsed out the interwoven components of the conflict that are mitigated with a peaceful resolution (e.g., the economic and military costs of not maintaining a militarized border). The Romania-Colombia example reflects this, as both countries view the prospect of abandoning the claim outright as more valuable than maintaining the costly dispute. While this seemingly abnormal situation is likely only in a domain of gains, it demonstrates that payoff values are not concretely tied to territorial control.

Because the Nash point may lie somewhere between two pure strategy solutions, it can be defined as a percentage of either strategy. In the Romania-Colombia example, the solution N lies somewhere between Romania Abandon/Colombia Seize and Romania Seize/Colombia Abandon. This ratio begins to draw a line in the sand that will demarcate the Romanian-Colombian border.

The frequency of Romania Abandon/Colombia Seize can be determined by Equation (5).

$$(5) \quad 1 - (|X_{Nash} - X_{RA/CS}| / |X_{RA/CS} - X_{RS/CA}|)$$

Where, $X_{RA/CS}$ is Romania's value if they abandon and Colombia seizes, and $X_{RS/CA}$ is Romania's value if they seize and Colombia abandons. Therefore,

$$1 - (|2.43 - -3| / |-3 - 8|) = 1 - (5.43/11) = 50.64\%$$

That is, the Romania Abandon/Colombia Seize strategy should be played 50.64 percent of the time, and Romania Seize/Colombia Abandon the remaining 49.36 percent to achieve the arbitrated payoff N . In this example, Colombia would be awarded slightly over half of the total territory in dispute.¹⁰⁹

¹⁰⁹ Recall that Colombia had a stronger strategic position within the dispute. Awarding them more land (although practically negligible in this example) reflects that.

If the territory in dispute is not homogeneous and has some areas more inherently valuable than others, it would not be wise to simply divide the area of the disputed territory in half (or whatever the resulting ratio is). Rather, it is the *value* of the territory that should be split. The value can be determined multiple ways. As one example, the terrain can be subdivided by land use/type and each country can assign a value (utility) per area for each land type. A modified adjusted-winner procedure can be performed, which uses the pure strategy solution ratio determined above as the “equitable” point in the procedure.¹¹⁰

F. MODEL SUMMARY AND HYPOTHESIS INTEGRATION

This chapter presents a territorial dispute resolution model that first integrates prospect theory (specifically, domain determination) into game theory. Second, it utilizes Nash arbitration to compute a fair result, and, finally, outlines how a numerical Nash solution is implemented geographically. Each of these steps is useful for testing the hypotheses presented in this thesis.

The first hypothesis seeks the applicability of the resolution model. It states that territorial disputes are most arbitrable when both states are in a domain of gains, and less arbitrable when either or both are in a domain of losses. Determining a country’s domain and then allocating their payoffs tests this hypothesis. If one, or both, countries are in a domain of losses (risk seeking) and the payoffs do not provide arbitration with the greatest utility,¹¹¹ then the hypothesis is supported. Also, if both countries are in a domain of gains and the payoff schemes support cooperation and arbitration, the hypothesis is further confirmed.

¹¹⁰ Cases where the Nash determined land division is not equal (e.g., 25%:75%) would obviously not be “envy free” or “equitable” within the adjusted winner procedure—but that is not required. Arbitration has already resolved these points, and the adjusted winner procedure is simply dividing the “pie” in a way that does not require inter-personal utility comparisons. For more on the adjusted winner procedure, see Steven J. Brams and Alan D. Taylor, *Fair Division: From Cake-Cutting to Dispute Resolution* (Cambridge, U.K.: Cambridge University Press, 1996).

¹¹¹ This is feasible, as risk-seeking countries will likely have dominant strategies or first moves that are more advantageous than an arbitrated payoff. Game play will demonstrate the country would be better off accepting risk, avoiding cooperation, and going for higher payoffs.

The second hypothesis seeks to establish the acceptability of arbitration. It states that if both states are in a domain of gains, the acceptability of Nash arbitration in territorial disputes increases. This is a natural conclusion from the first hypothesis and inherent within Nash's scheme. By maintaining a domain of gains, a country is likely to arbitrate to avoid conflict. This same perspective also leads to a perceived parity of gains from Nash's bargaining solution: both countries are better off than they would be in non-cooperative play, strategic positions are considered (via the chosen "status quo" point), and the solution is Pareto optimal. Neither country could do better unilaterally. Countries that do not find the solution N fair are likely not candidates for arbitration in the first place.

The final hypothesis seeks to determine the durability of the model. It states that Nash arbitration is most durable when dynamic dispute conditions generate fewer aberrations to results over time. Applying the model to various time periods within the conflict tests this hypothesis. If the conflict is relatively stable, each game created will likely have similar payoffs, therefore negotiations sets and solutions. The point N determined today should then be a durable solution. However, if a conflict is highly dynamic over the period, the countries will probably have changing strategic positions and strengths throughout the dispute. This will result in games with payoffs that produce a greater variety of negotiation sets. The solution N determined under present conditions may not reflect an enduring solution.

The next chapter will present an in-depth case study and apply the model to the dispute. To further test the hypotheses, Appendix A has an additional case study vignette with solution.

IV. KURIL ISLANDS CASE STUDY

A. INTRODUCTION

Russia and Japan have not signed a peace treaty to conclude World War II, due in large measure to a dispute over the Southern Kuril Islands.¹¹² Russia maintains control of the islands since seizing them at the end of the war, while Japan has irredentist claims that the islands have always been Japanese. The now intractable territorial dispute is more of an emotional symbol of Russo-Japanese relations writ large than a rational negotiation over remote, bleak terrain. Finding a peaceful, arbitrated resolution to this conflict would benefit many Pacific nations, and greatly improve Russo-Japanese relations.

This chapter begins with a brief summary of the Kuril Islands: their geography, pre-dispute history, and importance. Next, the dispute history is broken into pertinent time periods from 1855 to today. The history section informs the analysis on Russian and Japanese decision making, both their framing and their domain. Finally, the arbitration model is applied. A game is created that simulates today's strategic conditions and a geographic solution to the dispute offered, which grants Japan control of the Southern Kurils. Analysis of the durability of this Nash solution (compared to previous hypothetical results) finishes the chapter.

1. Geography

The Kuril Island chain stretches 740 miles northeast from the Japanese home island of Hokkaido to the southern tip of Russian Kamchatka (Figure 20). The arc of thirty-six islands and innumerable islets divides the Sea of Okhotsk to the west from the Pacific Ocean to the east.

¹¹² Tsuyoshi Hasegawa, *Between War and Peace, 1697–1985*, vol. 1 of *The Northern Territories Dispute and Russo-Japanese Relations* (Berkeley: University of California Press, 1998), 2.

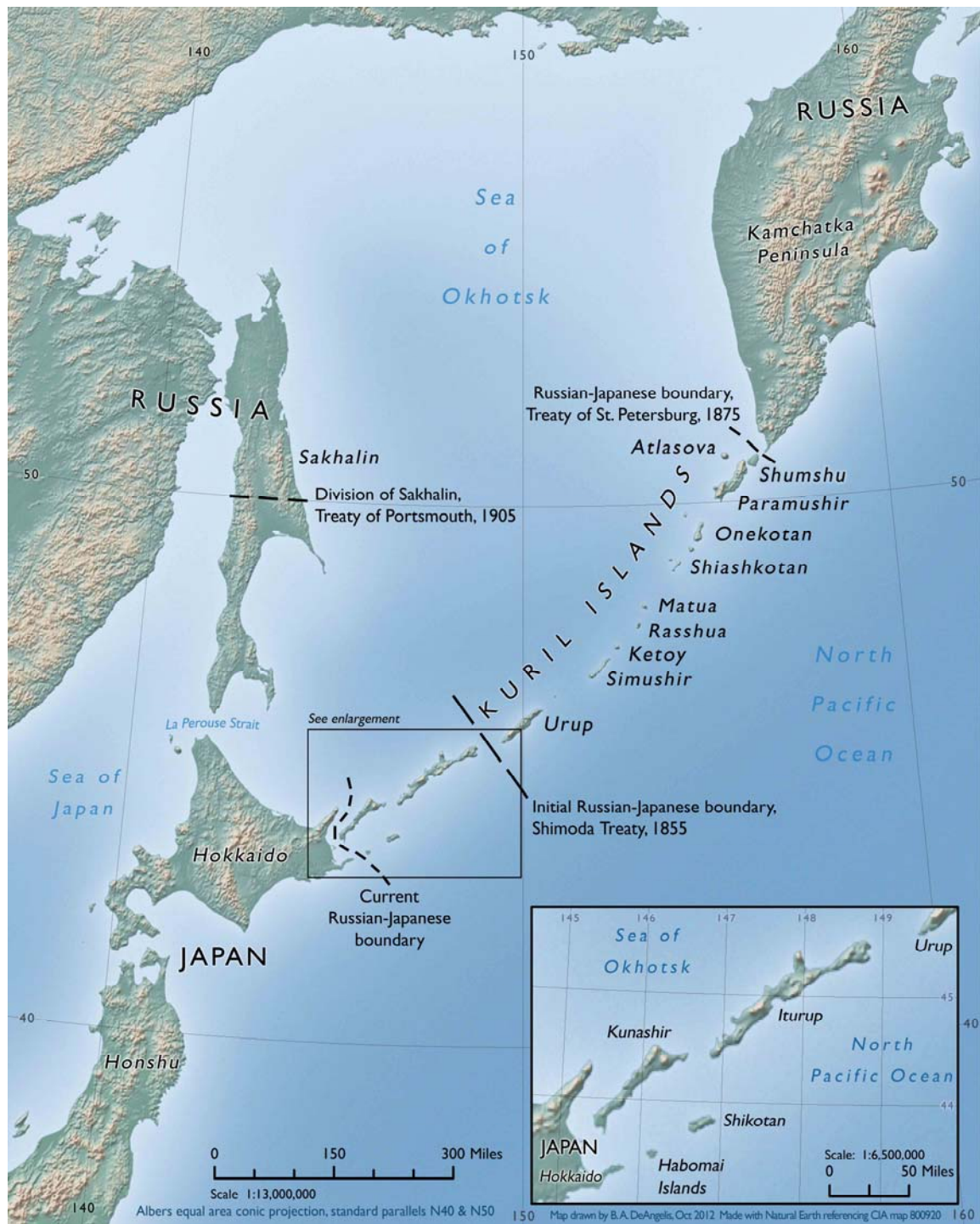


Figure 20. Kuril Islands chain with previous divisions.¹¹³

¹¹³ Map by author. Maps optimized for black and white printing are in Appendix B.

The Kurils have an area of 6,000 square miles, about half of which is on the four largest islands (two of which are in the Southern Kurils): Iturup (Etorofu), Kunashir (Kunashiri), Urup, and Paramushir.¹¹⁴ In relation to more familiar islands, the Kurils are slightly smaller than the Hawaiian Islands, and Iturup is twice the size of Okinawa. The islands are on a very active portion of the Pacific “ring of fire,” with frequent earthquakes and volcanic eruptions. Weather and waves are also dangerous. Narrow channels and tides generate thirty-five foot “super waves,” tsunamis threaten coastal development, and the confluence of warm and cold, in both the air and sea, creates unstable and violent meteorological and oceanic conditions.

The neatly arrayed arc of volcanic islands appears as if stepping-stones connecting the two Asian powers. The islands have a frontier quality to both Russia and Japan; they have never been fully developed. While nearly the “end of the world”¹¹⁵ for continental Russia, the islands have a close proximity to the Japanese home islands. The proximity is mostly geographic, however, as the small islands were difficult to access for centuries and they remain somewhat culturally and psychologically distant. The Kurils, despite their relative remoteness, define the meeting point between the Russian and Japanese people. Today, the chain marks “the intersection of Russian, Japanese, and American power spheres in the North Pacific.”¹¹⁶

2. Pre-dispute History

The native people of the Kuril Islands are the Ainu, although other cultures likely preceded them.¹¹⁷ Japanese and Europeans first contacted aboriginal Ainu on the Kurils in the seventeenth century. Ainu in the Northern Kurils

¹¹⁴ John J. Stephan, *The Kuril Islands: Russo-Japanese Frontier in the Pacific* (Oxford: Clarendon Press, 1974), 1. Note: Russian island names are used. Japanese names, when applicable, are parenthesized when first mentioned.

¹¹⁵ Semion Shurtakov, “Na Krai Sveta,” *Ogoniok* 40 no. 13 (March 1962), 12.

¹¹⁶ Stephan, *The Kuril Islands*, 1.

¹¹⁷ The Ainu ranged over the Kuril Islands, Hokkaido, and the now Russian island of Sakhalin.

developed distinctly from their cousins in the South. The southern Ainu were more connected to Ainu peoples on Hokkaido, and much of their history is interwoven. Differences between Northern and Southern Ainu became more pronounced as Japan and Russia intruded into the Kurils.

In 1638, Shogun Tokugawa banned foreigners from the shores of Japan, “closing” the country. Foreign contact was minimal for over 200 years until Japan was “opened” in the mid-nineteenth century, generally attributed to Commodore Matthew Perry. The American and British interests in Japan were generally trade focused. Russia’s principle interests, however, were first to define its border with its neighbor, and then to counter the growing influence of Europeans and Americans in the Far East.

Russians had been exploring the Kurils since the early eighteenth century, nearly the same time the Japanese were advancing north, and the border was mutually unclear. Each was probing the islands to determine the depth of the other’s advance up and down the chain.¹¹⁸ These explorations led to a more accurate understanding of the Kuril Islands, but no definitive claims of discovery or ownership. As historian John Stephan summarizes,

Ultimately, the honour of discovering and exploring the Kuril Islands must be shared by several nations. The Japanese first wrote about the archipelago’s existence. A Dutchman put some of the islands on a map. The Russians ascertained the arc’s length and breadth and gave it a reasonably accurate cartography. An acerbic Frenchman saddled the chain with an unsavory reputation.¹¹⁹

However, by the end of the eighteenth century, a *de facto* boundary between Russia and Japan existed between the islands of Iturup and Urup.¹²⁰ In

¹¹⁸ Stephan, *The Kuril Islands*, 36–56.

¹¹⁹ Stephan, *The Kuril Islands*, 56.

¹²⁰ Gregory L. Morris, “Japan, Russia and the ‘Northern Territories’ Dispute: Neighbors in Search of a Good Fence” (master’s thesis, Naval Postgraduate School, 2002).

1821, Russian Emperor Alexander I unilaterally decreed Russian territorial waters as north of the southernmost tip of Urup.¹²¹

After the opening of Japan, Russian Admiral Yevfimy Putyatin went to Japan in 1853 to settle the boundary and open diplomatic and commercial relations. Negotiations were difficult, with both Russia and Japan claiming the entire Kuril chain. Eventually a compromise was reached in the 1855 Shimoda Treaty that formalized the first border; Russia occupied Urup, Japan occupied Iturup, and the border divided the channel between the two islands.¹²² This is the first and last time Russia and Japan negotiated their Kuril border as relatively equal powers in peace.¹²³

3. Importance

The volcanic islands in and of themselves hold little value. Timber and minerals do not present themselves in enough abundance to be economically viable and agriculture is virtually non-existent. The remoteness and difficult living conditions keep settled populations small, with little infrastructure and minimal industry.

Offshore, however, the islands are a bounty. The mixing of warm currents from the Sea of Japan with frigid North Pacific currents creates a productive and diversified fishery. The rocky island coasts also shelter dense kelp and seaweed forests. Virtually all economic activity within the Kurils is directly or indirectly related to the fishing industry, although eco-tourism holds promise if developed.¹²⁴

¹²¹ Stephan, *The Kuril Islands*, 60.

¹²² Hasegawa, *Between War and Peace*, 24–25.

¹²³ Interestingly, Morris points out, “[T]he border demarcation between Russia and Japan marked Japan’s formal acceptance of the Western system of nation-states with political boundaries. Being an island people, the Japanese hitherto had seen no need to define their borders until the Russians forced them to.” Morris, “The ‘Northern Territories’ Dispute,” 12.

¹²⁴ Hasegawa, *Between War and Peace*, 7.

Additionally, each island serves as an anchor for a 200-nautical-mile exclusive economic zone encompassing the surrounding waters. The 1982 United Nations Convention on the Law of the Sea codifies the zones, granting each state special rights over the exploration and use of marine resources.¹²⁵ This makes each island individually valuable, and serves as the foundation for economic arguments over control of the islands.

Geo-strategically, the Kurils have historically been vitally important, although their significance has waned. In 1941, Japan controlled the entire Kuril chain and launched the Pearl Harbor attack from sheltered Hitokappu Bay on Iturup's Pacific coast. The imperial fleet was able to rendezvous and sail undetected out of the sea lanes from its Kuril launch point. The islands were also the last line of defense from a northern allied attack on the Japanese home islands.

After the war, the Soviet Union seized and controlled the entire island chain. It first served as a line of defense for Siberia, and later for preventing American intrusion into the Sea of Okhotsk, where the Soviets maintained a ballistic missile submarine "bastion" capable of launching a retaliatory nuclear strike.¹²⁶ American occupied Japan presented the Soviet Union with a substantial threat on their Far East border, a fact Nikita Khrushchev recalled in his memoirs: "It would have been sheer folly to relinquish the islands to Japan when the country was essentially under American occupation. We figured the minute we gave Japan the two islands, the United States would turn them into

¹²⁵ Third United Nations Conference on Law of the Sea, "United Nations Convention on Law of the Sea," December 10, 1982, 43–53, http://www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf.

¹²⁶ Tsuyoshi Hasegawa, *Neither War nor Peace, 1985-1998*, vol. 2 of *The Northern Territories Dispute and Russo-Japanese Relations* (Berkeley: University of California Press, 1998), 530.

military bases.”¹²⁷ The Kurils were of vital strategic importance to the Soviet Union as Soviet-Japanese relations were essentially viewed as Soviet-American relations.¹²⁸

Since the fall of the Soviet Union, the Kuril Islands have lost much of their strategic importance. Russia does not face invasion of its east from Japan or the United States, and there is little need to defend the Sea of Okhotsk as an impenetrable fortress. However, the islands remain the seam of American-Russian-Japanese power, and geo-strategic potential will always exist in this environment.

B. DISPUTE BACKGROUND

As frontier borderlands for both Russia and Japan, the Kurils have rarely been anything but an ambiguous or contested border. The Shimoda Treaty in 1855 and the Treaty of St. Petersburg in 1875 are the only time ownership of the chain was clearly and incontestably defined under peaceful means. The conclusion of the Russo-Japanese War in 1905, and World War II in 1945, also saw Japan and Russia exchange lands, but much more acrimoniously. Possession of the Kurils has not changed since September 1945. This section will first condense the voluminous record of Russo-Soviet interactions over the Kuril Islands, and then define the current status quo.¹²⁹

1. Previous Losses and Gains

a. *Treaties of Shimoda and St. Petersburg—1855 and 1875*

Japan and Russia defined their Kuril border for the first time with the Shimoda Treaty in 1855:

¹²⁷ Nikita Khrushchev, *Khrushchev Remembers: The Glasnost Tapes*, trans. and ed. Jerrold L. Schecter (Boston: Little, Brown and Co., 1990), 89.

¹²⁸ Morris, “The ‘Northern Territories’ Dispute,” 31.

¹²⁹ For the sake of brevity, many events—some significant—must only be scarcely mentioned, if at all. For a complete and objective record, see the works of Tsuyoshi Hasegawa.

Henceforth the frontier between Japan and Russia will run between the islands of Iturup and Urup. The entire island of Iturup belongs to Japan and the entire island of Urup, as well as the other Kuril Islands to the north of that island, belong to Russia. As for the island of Karafuto (Sakhalin), it remains heretofore undivided between Japan and Russia.¹³⁰

In addition to defining the Kuril border, the treaty also started Russo-Japanese diplomatic relations and opened three Japanese ports to trade. However, the Shimoda Treaty did not find a resolution demarcating a Russian-Japanese border on the island of Sakhalin, to the west of the Kurils. Russians were living on the north of the island, and Japanese had occupied the south.

The ambiguous Sakhalin situation was unpleasant to both. Japan interpreted that Russians would not move south, where the Japanese had influence, but Russia took the lack of division to mean they were free to move across the island.¹³¹ Sakhalin was important to Russia as the entryway to the Amur River basin (defining the boundary between Russia and Manchuria), as well as providing Russian access to the Sea of Japan via La Perouse Strait, between Sakhalin and the Japanese home island of Hokkaido.

By 1867, a weakened Japanese shogunate was forced to accept Russia's right to move into southern Sakhalin with the Provisional Rule on Joint Residence. In 1868, the shogunate was overthrown and replaced by the Meiji government, which did not recognize the Provisional Rule. The new government, however, was in a poor position to challenge Russia. Conflict could mean not only the loss of Sakhalin, but Hokkaido as well.¹³² Japan made concessions, and the Treaty of St. Petersburg in 1875 granted all of Sakhalin to Russia in exchange for the remainder of the Kuril chain. Japan now controlled all the

¹³⁰ Graham Allison, Hiroshi Kimura, and Konstantin Sarkisov, *Beyond Cold War to Trilateral Cooperation in the Asia-Pacific Region: Scenarios for New Relationships Between Japan, Russia, and the United States*, Strengthening Democratic Institutions Project (Cambridge, MA: John F. Kennedy School of Gov., Harvard University, 1992), 76.

¹³¹ Hasegawa, *Between War and Peace*, 25.

¹³² Hasegawa, *Between War and Peace*, 25–26.

islands from Hokkaido to the Russian peninsula of Kamchatka. It would maintain complete control of the Kurils for the next seventy years, until 1945.

b. Russo-Japanese War–1905

Although Japan was in a relatively weak position regarding the Russians in 1875, by “1890 Japan was an emerging imperialist country preparing to subjugate weak neighbors.”¹³³ With aims at China and Korea, Japanese interests were clashing with Russian. Tensions climaxed with the Russo-Japanese War, starting in 1904. Japan defeated Russia, culminated by the annihilation of the Russian Baltic fleet in the Tsushima Straights in 1905. In the peace terms, Russia granted the entire island of Sakhalin to the Japanese. Ownership of the Kurils did not change, as Japan already controlled the entire arc, but it is important to note the war “left an indelible sense of humiliation on the Russian consciousness.”¹³⁴ While the next decades saw periods of peace—and even alliances—between Russia and Japan, they were not without suspicion and caution. The Kurils would continue to simmer.

c. World War II–1945

During World War II, Soviet aspirations for the Kurils were clear. The Soviet Union first requested the entire chain as the price for a non-aggression pact with Japan in 1940; at the time, Japan was in a position to decline. Joseph Stalin approved of the 1943 Cairo Declaration, which, among other things, stated, “Japan will also be expelled from all other territories which she has taken with violence and greed.”¹³⁵ Although Japanese control of the Kuril chain does not technically fall into this category, the declaration clearly showed Stalin that the Americans and British were willing to transfer sovereignty of Japanese held islands. More importantly, President Roosevelt was likely unclear on the history of the Kurils, mistakenly believing they were a Russo-

¹³³ Hasegawa, *Between War and Peace*, 27.

¹³⁴ Hasegawa, *Between War and Peace*, 29.

¹³⁵ Stephan, *The Kuril Islands*, 240.

Japanese war conquest, not an issue settled diplomatically in 1875. Stalin did not correct the misinterpretation, and conflated the Kurils and Sakhalin as land that was “taken from my country.”¹³⁶

By the Yalta conference in 1945, President Roosevelt should have been better informed, as a State Department memo drafted to prepare the President specifically focused on the post-war division of the Kuril chain. Specifically, it stated that Japan has the strongest claim on the southern group of islands, in large part due to indisputable “historic possession,” while the Soviet Union has a strong claim on the northern group of islands.¹³⁷ However, by the conclusion of the Yalta conference in February 1945, Stalin was assured the Kuril Islands would be “handed over” as a condition of Soviet entrance into the war with Japan.¹³⁸

World War II in the Pacific ended on the Kurils Islands, as the Soviets started their invasion on August 17th—days after the announced Japanese surrender. Operations were not concluded until September 4th, when the entire chain was occupied.¹³⁹ Japanese living on the islands were evacuated to Hokkaido, and annexation as Soviet territory was complete by 1947.

d. Treaty of San Francisco—1951

The 1951 Treaty of Peace with Japan (also known as the Treaty of San Francisco) formally ended the war between Japan and the Allies. In the treaty:

¹³⁶ William D. Leahy, *I Was There* (New York: Whittlesey House, 1950), 318.

¹³⁷ Stephan, *The Kuril Islands*, 242.

¹³⁸ Stephan argues Roosevelt was quick to hand over the entire chain (in a 15-minute private session) still thinking Japan had seized them in the Russo-Japanese war. See Stephan, *The Kuril Islands*, 153–155. However, even with full knowledge of Kuril history, Roosevelt very well could have seen the Southern Kurils as a small price to pay for Soviet entry into the Pacific War. In fact, Leahy sees no problem with the “misnamed ‘concessions’” made to the Soviets during the meeting. See Leahy, *I Was There*, 318.

¹³⁹ David Rees, *The Soviet Seizure of the Kuriles* (New York: Praeger, 1985), 78–82.

Japan renounces all right, title and claim to the Kuril Islands, and that portion of Sakhalin and the islands adjacent to it over which Japan acquired sovereignty as a consequence of the Treaty of Portsmouth of September 5, 1905.¹⁴⁰

In the Japanese text, the Kuril Islands are referred to as *Chishima Retto*, which to the Japanese always conceptually included both Iturup and Kunashir. Fully understanding the territorial history of the Kurils and their continuous control of the southern islands, the Japanese delegation to San Francisco did not believe that the southern islands of Iturup, Kunashir, Shikotan, and the Habomai group¹⁴¹ were part of the Kuril Islands being ceded away. They lodged a delicate protest with the American representative John F. Dulles on the wording of the treaty. Unbending on the verbiage, Dulles informed the Japanese they could make their claim known during a speech to the convention, which chief Japanese delegate Shigeru Yoshida did:

With respect to the Kuriles and South Sakhalin, I cannot yield to the claims of the Soviet Delegate that Japan had grabbed them by aggression. At the time of the opening of Japan, her ownership of the two islands of Etorofu [Iturup] and Kunashiri [Kunashir] of the South Kuriles was not questioned at all by the Czarist government... Even the islands of Habomai and Shikotan, constituting part of Hokkaido, one of Japan's main islands, are still being occupied by Soviet forces...¹⁴²

It is during the San Francisco peace conference that the United States' role in the Kuril dispute becomes more than that of an innocuous third party. A scholar on Russo-Japanese relations and the Kuril dispute, Tsuyoshi Hasegawa argues that Dulles intentionally muddled the waters on which islands constituted "Kuril Islands." Dulles stated:

Some question has been raised as to whether the geographical name "Kuril Islands" mentioned in Article 2 (c) includes the Habomai Islands. It is the view of the United States that it does not.

¹⁴⁰ Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, 108.

¹⁴¹ Habomai is the collective name for a group of six tiny islets, none of which actually have the name Habomai. The group is often referenced as a single island.

¹⁴² Hasegawa, *Between War and Peace*, 103.

If, however, there were a dispute about this, it could be referred to the International Court of Justice under Article 22.¹⁴³

Hasegawa notes Dulles mentions only the Habomai island group, leaving out the larger islands of Iturup, Kunashir, and Shikotan that Japan claims has always been Japanese territory and never previously exchanged. Hasegawa argues, “Dulles’s major objective was to keep the geographical definition of the Kuril ambiguous so as to make sure that this would become a long-lasting conflict between the Soviet Union and Japan.”¹⁴⁴ With Cold War battle lines being drawn, Foster intended to keep Japan in the American sphere of influence, granting the United States significant power in the Far East. This tactic also focused Japanese irredentism to the north, away from the south where the United States wanted to maintain control of Okinawa.¹⁴⁵ Dulles’s posturing notwithstanding, Hasegawa notes, “As long as Japan accepts the terms of the San Francisco Peace Treaty, it is not entitled to Kunashiri [Kunashir] and Etorofu [Iturup].”¹⁴⁶

The Soviet Union had reservations about the Treaty of San Francisco and did not sign the accord.¹⁴⁷ By not signing the treaty, the Soviet Union forfeited “the opportunity to acquire unquestioned title” to the Kuril Islands, essentially placing them in “international limbo.”¹⁴⁸ To the Soviets, however, their *de facto* control was anything but. They had gained the islands as a result of victory over vanquished Japan. Regardless of Japanese claims that the Southern Kurils were not part of the Kuril chain and had always been Japanese islands, the Russians had invaded, occupied, and annexed the lands during war,

¹⁴³ Hasegawa, *Between War and Peace*, 102.

¹⁴⁴ Hasegawa, *Between War and Peace*, 102.

¹⁴⁵ Hasegawa, *Between War and Peace*, 89.

¹⁴⁶ Hasegawa, *Neither War nor Peace*, 526.

¹⁴⁷ This was likely another product of Dulles’s strategic plan to weaken the Soviet threat in the Far East. See, Hasegawa, *Between War and Peace*, 78–104.

¹⁴⁸ Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, 5.

therefore rightfully claiming them. It was acquisition of territory through conquest, something the Soviets did worldwide during the war.

e. Soviet-Japanese Joint Declaration—1956

It is likely that the Soviets soon realized their strategic failure in San Francisco, particularly after Stalin's death in 1953. Changes were also taking place in Japan, with a new prime minister and ideas of a more independent foreign policy. The first round of negotiations between Russia and Japan to resolve their diplomatic impasse took place in 1955. The chief negotiator for the Japanese, Shun'ichi Matsumoto, was provided instructions that contained the "return of Habomai and Shikotan, the Kurils, and southern Sakhalin."¹⁴⁹ Supplementary instructions prioritized the effort: first, Habomai and Shikotan; second, the Southern Kurils (Kunashir and Iturup); and third, the Northern Kurils and Sakhalin. Notably, the return of Habomai and Shikotan was considered sufficient for a treaty.¹⁵⁰

The Soviet negotiator, Yakov Malik, at one point made overtures of returning Habomai and Shikotan with the consent that the American-Japanese security treaty was not directed at a third country.¹⁵¹ For a brief period, a resolution to the Kuril dispute and a peace treaty between Japan and the Soviet Union looked possible. However, both Japan and the Soviet Union were undergoing internal power shifts during this time, which affected their positions during negotiations. Upon consulting Tokyo for final instructions before concluding a treaty, Matsumoto was informed that Habomai and Shikotan were no longer sufficient—all four islands of the Southern Kurils must be returned.

Even more impactful, perhaps, was American influence over the Japanese. The United States had strong interests in Japan. As Hasegawa summarizes:

¹⁴⁹ Hasegawa, *Between War and Peace*, 108.

¹⁵⁰ Hasegawa, *Between War and Peace*, 108–109.

¹⁵¹ Hasegawa, *Between War and Peace*, 111.

It was with apprehension that the United States watched Soviet overtures to Japan... There were two matters that [the U.S.] had to avoid at all costs. First, if a Soviet-Japanese peace treaty were to resolve the territorial dispute between the countries, Japanese nationalism might be channeled into a demand for the return of Okinawa. Moreover, this nationalism might be directed at the withdrawal of the American military presence in Japan... a severe blow to U.S. global strategy.¹⁵²

Final negotiations took place in Moscow during the summer of 1956. Many issues between Japan and Russia had been settled, but the territorial dispute remained. Any hope of resolving it was crushed after U.S. Secretary of State Dulles intervened—the so called “Dulles intimidation:”

The Japanese might tell the Soviets that if they were forced to give up the Kuriles they would have to give up the Ryukyus as well. In its dealings with Japan the United States has been soft where the Soviet Union has been tough. Perhaps the United States should likewise get tough... If the Soviet Union were to take all the Kuriles, the United States might remain forever in Okinawa, and no Japanese government could survive.¹⁵³

Dulles made it clear that it was unacceptable to the U.S. for Japan to remove its claim on all the Southern Kurils. Accepting the return of only Habomai and Shikotan would essentially release any Japanese claim to Okinawa. Japan was used a pawn in the Cold War American-Soviet chess match. The Soviets were essentially doing the same to Japan as well, remaining steadfast in not returning any islands so long as Americans controlled Okinawa.

Ultimately, negotiations failed to produce a peace treaty. The Soviets maintained the viewpoint that they were the victor of WWII and a peace treaty should reflect this. The Japanese, however, wished to correct the wrongs of the Soviets.¹⁵⁴ In spite of this, the Japanese and Soviets did sign a joint declaration and the end of negotiations in October 1956. The declaration ended

¹⁵² Hasegawa, *Between War and Peace*, 114.

¹⁵³ Hasegawa, *Between War and Peace*, 124–125.

¹⁵⁴ Hasegawa, *Between War and Peace*, 134–135.

the state of war and normalized relations, including the return of prisoners of war. Russia also committed itself to the return of the Habomai islets and Shikotan:

[T]he Union of Soviet Socialist Republics, desiring to meet the wishes of Japan and taking into consideration the interests of the Japanese State, agrees to transfer to Japan the Habomai Islands and the island of Shikotan, the actual transfer of these islands to Japan to take place after the conclusion of a Peace Treaty between the Union of Soviet Socialist Republics and Japan.¹⁵⁵

After the United States and Japan signed a revised security treaty in 1960, Soviet Premier Khrushchev modified the goodwill the Soviets displayed four years previous, attaching the stipulation that Habomai and Shikotan would only be returned after a signed peace treaty and “all foreign troops are withdrawn.”¹⁵⁶ Japan immediately rejected the unilateral approach to modifying the signed and ratified Joint Declaration, and the Soviet change has no binding legal status.

f. Previous Losses and Gains Summary and Analysis

Both Russia and Japan have controlled the entire Kuril chain (every island from Hokkaido to Kamchatka) at some point in time, making sovereignty claims interwoven.¹⁵⁷ The first division of the islands in 1855 still makes logical sense today—it appears on the surface as the limits of both Russia and Japan’s traditional influence. Japan’s control of the entire chain in 1875 actually came from a position of weakness, as it gave up the more valuable island of Sakhalin. With the conclusion of The Russo-Japanese war in 1905, relations were at an all-time low. While the Kuril Islands themselves did not trade hands, negative stereotypes on both sides were reinforced, and many remain to this day.¹⁵⁸ Acting on resentment and sound geo-strategic ideas, the Soviet

¹⁵⁵ Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, 112.

¹⁵⁶ Hasegawa, *Between War and Peace*, 137.

¹⁵⁷ However, it is only since 1945 that Russia has held the traditionally Japanese islands of the Southern Kurils, what have been termed the ‘Northern Territories’ in Japan.

¹⁵⁸ Morris, “The ‘Northern Territories’ Dispute,” 16.

Union seized the entire chain even after the Japanese formally surrendered in World War II. The Japanese took the Soviet seizure of their “inherent homeland” after the surrender as a wrong, and their new ally, the United States, did little to right it. Rather, the U.S. incubated the dispute as part of Cold War geo-politics.

Japanese-Russian negotiations over the past five decades have failed to significantly advance the dispute beyond the 1956 Joint Declaration. Talks had potential in the early 1990s as Russia sought to redefine itself post-Cold War, however, neither nation could move past the symbolic meanings attached to the islands, and negotiations faltered. This is due to both internal and external factors.

For Japan, periods of internal political change create episodes where nationalism comes to the fore. This feeds the sense of loss felt by the Japanese and negotiations are therefore more difficult. During less internally-emotive times (e.g., when Japan sought to conclude the dispute in 1956), the United States sabotaged the Japanese effort during the Cold War. Coercion to meet American policies limited the negotiation set of the Japanese, and successful negotiations were not possible, regardless of their domain.

For the Russians, internal nationalism comes into play as well. Shikotan and Habomai were initially seen as bargaining chips by the Soviets, but the duration and ensuing intractability of the dispute has made these minor, and traditionally Japanese, islands feel more “Russian.” Their role as bargaining chips has severely lessened. Externally, Russia had to view its Kuril dispute nearly as a dispute with the United States, as any Japanese gain during the Cold War was essentially an American gain. While internal nationalism and politics for both Japan and Russia will continue to influence the ability to negotiate, the negative influence the Americans had on negotiations has passed with the end of the Cold War. It is now in American interests to see Japan and Russia resolve this Pacific dispute.

While both Japan and Russia could have framed a domain of gains and successfully arbitrated during the Cold War, this was not likely because of the strong American influence in—if not control of—Japanese affairs. Only since the collapse of the Soviet Union is the environment truly suited for successful arbitration. Figure 21 visually summarizes the territorial losses and gains of Japan and Russia, as well as their domains over the dispute period.

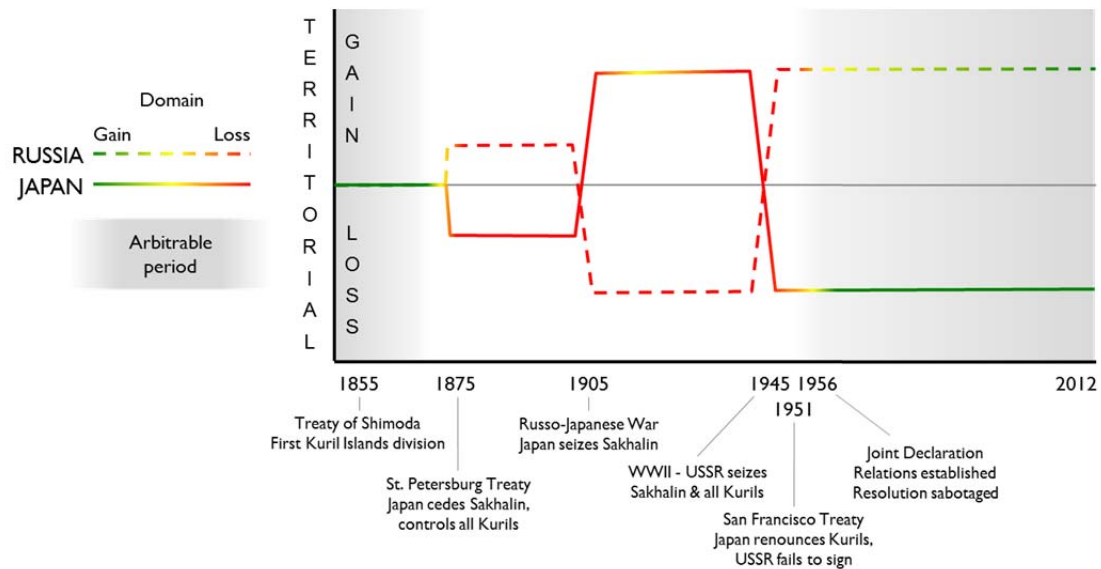


Figure 21. Kuril Islands dispute trend lines.

2. Status Quo

The Kuril Islands can no longer claim the strategic significance they had during the Cold War; they are significant now only in their symbolism.¹⁵⁹ While Russia currently controls the entire chain *de facto*, it has a weak *de jure* claim, a result of failing to sign the Treaty of San Francisco. Japan, too, has a weak *de jure* claim on the larger islands of Iturup and Kunashir, as it fully renounced the Kurils in the same treaty. International law only supports the return of Habomai and Shikotan to Japan upon conclusion of a peace treaty, according to the 1956 Joint Declaration. Otherwise, "it is not law but the outcome of diplomatic

¹⁵⁹ Morris, "The 'Northern Territories' Dispute," 36.

negotiations between Russia and Japan that will determine the ultimate sovereignty of [the islands].”¹⁶⁰

For purposes of this thesis’s model, the dispute is stable, as discussed in Chapters II and III. Therefore, the status quo is cartographically scoped to the extent of Japan’s claim: Iturup, Kunashir, Shikotan and the Habomai.¹⁶¹ Russia controls all four islands, but will unequivocally return the latter two upon successful arbitration (defined as resulting in a peace treaty). Therefore, successful negotiations result in the transfer of at least two islands. Japan has the potential to receive two more islands (at most), fulfilling their claim. If Russia prefers to retain all four islands, arbitration cannot be successful, as the terms of the Joint Declaration must be met. However, for arbitration to be successful, the conflict cannot be looked at in such zero-sum terms as exchanging islands. As political scientist Graham Allison states, “Russia will not give up anything to anyone unilaterally—nor should it be expected to.”¹⁶² The dispute must be transformed into a positive sum game that advances Russian and Japanese interests in all dimensions.¹⁶³

Maintaining the dispute is costly for both sides. Although no longer formally at war, Russia and Japan are not formally at peace. This diplomatic limbo, while many times only symbolic, has impeded full partnership of many Russian-Japanese efforts. On critical issues, such as fishing,¹⁶⁴ compromise has been made, although far from ideal.¹⁶⁵ However, the two powers could be better

¹⁶⁰ Hasegawa, *Neither War nor Peace*, 528.

¹⁶¹ The status quo is also not susceptible to threats, therefore security positions will not be used during Nash arbitration. This thesis assumes present-day Russia and Japan are not willing to resort to armed conflict to resolve the Kurile dispute.

¹⁶² Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, ix.

¹⁶³ Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, ix.

¹⁶⁴ Twenty percent of the entire Russian catch comes from the Kurils. When previously under Japanese control, 10 percent of the Japanese catch came from the chain. Hasegawa, *Neither War nor Peace*, 528.

¹⁶⁵ Hasegawa notes the “current situation benefits neither side... Certainly by cooperating, Russia and Japan could find a solution that benefits both.” Hasegawa, *Neither War nor Peace*, 529–530.

joined economically: Japan can benefit from Russia's natural resources and Russia can benefit from Japan's capital. Russia is also incurring costs re-militarizing the islands, with two garrisons expected to be complete by 2014.¹⁶⁶ Russia has little incentive to reintroduce military forces to Kuril outposts other than the territorial dispute.

C. RUSSIAN DECISION MAKING

It is easy to see any movement on the territory dispute as a loss for the Russians. As a minimum, international law expects the exchange of two islands upon the competition of a peace treaty. This negative viewpoint is partially responsible for the strong statements from current Russian leadership. President Dmitry Medvedev visited the Kurils for a second time in July 2012, saying, "[The islands] are an important part of the Sakhalin region and an important part of the Russian land."¹⁶⁷ To successfully achieve formal peace, Russian leadership must not focus on the transfer of islands, but instead focus on the gains that can be made within the security, political, and economic dimensions.

1. Framing

Using principles of prospect theory, the conflict can be examined for default framing, then, if applicable, properly framed to enhance the success of arbitration. Recognizing the endowment effect, certainty effect, use of bargaining chips, accommodation to gains, and status quo bias will help Russia transition its default reference point to one where peace is viewed as a gain.

Because Russia has controlled the Kurils for over almost seventy years, their sense of endowment is strong. Recalling that that the endowment effect causes possessions to be assigned a higher value than if they were not owned,

¹⁶⁶ "Russia to Complete Kuril Troops' Reinforcement by 2014," *Russia Today*, August 28, 2012, <http://rt.com/politics/kuril-islands-defense-military-736>; See also, Adam Westlake, "Russian Navy Ships to be Sent to Disputed Kuril Islands North of Japan," *The Japan Daily Press*, August 15, 2012, <http://japandailypress.com/russian-navy-ships-to-be-sent-to-disputed-kuril-islands-north-of-japan-159212>.

¹⁶⁷ "Medvedev Visits Kuril Islands – 'Important Part of Russian Land,'" *Russia Today*, July 3, 2012, <http://rt.com/politics/medvedev-kuril-islands-visit-284>.

the default Russian frame views the Kurils as more valuable than they inherently are. To properly frame the Southern Kurils, Russian leaders must recognize the small, distant territory candidly: the islands have a severely depressed fishing economy with potential, but they no longer retain the vital geo-strategic interest they once had.¹⁶⁸

Knowing that a peace settlement requires the transfer of Shikotan and the Habomais, the certainty effect can cause the loss of these islands to also be outweighed (favoring risk-seeking behavior) in Russia's default viewpoint. Instead, Russia should view these two small Southern Kuril Islands for what the Soviets intended them to be—bargaining chips. The 1956 Joint Declaration makes it clear that the Soviet Union sought to induce the Japanese into a peace agreement with the prospect of gaining Shikotan and Habomai. These islands must be viewed in the same vein during current negotiations. Not only does this framing remove the negative influence of the certainty effect, it also reduces the Russian endowment.

Even if Shikotan and Habomai are viewed as bargaining chips, Russia has fully accommodated to the gain of Kunashir and Iturup over the past half century. Defending this accommodated gain can again induce risk-seeking behavior. This underpins the importance of viewing any transfer of islands not as a loss, but as an opportunity for gain. If Russia is expected to transfer the larger islands of Kunashir and Iturup, it must in return receive a “package that advances Russian interests in every dimension... enhancing their security, political standing and economic well-being.”¹⁶⁹

Russian leaders must also recognize the effect the status quo bias has on the default view of the conflict—an outweighed preference for the current state of affairs may cause a missed opportunity for a more valuable outcome. This,

¹⁶⁸ As an example of the overall immaterial value of the islands, Graham Allison postulates the “half-facetious ‘Krakatoa Scenario.’ If these four islands simply sank into the sea from natural causes, would the contention not disappear?” Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, 1–2.

¹⁶⁹ Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, ix.

combined with the previously mentioned factors, makes the best Russian reference point one that already incorporates the return of Shikotan and Habomai. This reference point prevents the transfer of these two islands from being viewed as a loss, but rather as bargaining chips to achieve gains. Now the negotiations can focus on the value of Kunashir and Iturup to both parties, as well as focus on how Russia can prevent future loss. More specifically, how Russia can secure international recognition of its sovereignty on Sakhalin and the rest of the Kuril chain.

2. Domain

The dispute over the Kurils is stable, as defined in Chapter II. Although saber rattling occurs over the years, Russia has generally displayed risk-averse behavior. While Russia's default domain can be framed in terms of loss, there is potential Russia can maintain a domain of gains—particularly if dispute resolution focuses on net the gains identified by Allison, Kimura, and Sarkisov. Specifically,

- i) Guarantees that Russia will retain all present rights to fish, natural resources, and the 200-mile economic zone around the disputed islands.
- ii) Guarantees that Russia will retain all current rights to free and safe passage of ships through the straits between Iturup and Kunashir, and between Iturup and Urup.
- iii) Gains in territorial terms from international recognition of Russia's sovereignty over southern Sakhalin and the eighteen non-disputed Kuril Islands.
- iv) Gains in national security from guarantees the disputed islands will be forever demilitarized, and a Russian role as a "cooperation partner" in the Japanese-American security treaty.
- v) Significant economic gains from Japanese payment for all costs of relocation, and long-term Japanese aid and investment in Russian Far East.¹⁷⁰

¹⁷⁰ Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, xi.

Russian leaders can then ask the question: if such a package were available, would they prefer this comprehensive agreement to the current stalemate?

D. JAPANESE DECISION MAKING

The Japanese, too, can easily frame the dispute in terms of loss—specifically, unrecovered loss. Previous to 1945, the Southern Kurils had always been Japanese; they were never part of the Russian controlled Kurils. For practical purposes, the Japanese have accommodated to the loss, but politically and emotionally, they have not.¹⁷¹ The Southern Kurils are called the “Northern Territories” in Japan, encapsulating their irredentist claim and sense of loss.

1. Framing

The Japanese view of the conflict is also examined for default framing, then, as applicable, framed alternatively to enhance the success of arbitration. Recognizing aspirations levels, accommodation to loss, and the isolation effect will help Japan transition its default reference point out of the domain of losses. Japan must be willing to provide Russia the gains it will require to reconceptualize the issue, and be “flexible on everything beyond the principle of sovereignty, including timing, modalities, and conditions.”¹⁷²

For the past six decades, the Japanese have desired the return of the four islands composing the Southern Kurils. This aspiration level makes Russian control of the disputed islands a loss for the Japanese.¹⁷³ The Japanese do not view the Northern Territories as land taken from Japan due to their aggression in World War II, but rather as homeland stolen by the Soviets after the formal

¹⁷¹ David Rees, “Soviet Border Problems: China and Japan,” *Conflict Studies* no 139 (London: Institute for the Study of Conflict, 1982), 23.

¹⁷² Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, xi.

¹⁷³ For an excellent explanation of Japan’s “Northern Territory Syndrome” and how it consumes Japan’s Russian policy, see, Tsuyoshi Hasegawa, “Conclusion: Russo-Japanese Relations in the New Environment—Implications of Continuing Stalemate,” in *Russia and Japan: An Unresolved Dilemma Between Distant Neighbors*, eds. Tsuyoshi Hasegawa, Jonathan Haslam, and Andrew C. Kuchins (Berkeley, CA: University of California, 1993), 423.

Japanese surrender.¹⁷⁴ Maintaining this default aspiration level is popular for nationalistic Japanese political purposes, but its inflexibility over the decades has hampered peace progress since the 1956 Joint Declaration.¹⁷⁵ Instead, the Japanese should shift their reference point so the return of the Russian controlled islands are a gain, which ultimately will provide the Japanese the best path to achieve their aspiration level.

Closely tied to the Japanese aspirational level is the unaccommodated loss of the islands. Americans initially stoked this sentiment to suit Cold War politics, but nationalist Japanese politics keep the loss alive today. To move closer to successful arbitration, the Japanese must accept the Southern Kurils were lost during World War II, no matter the historical possession before that point; the Soviet Union defeated Japan and seized the territory as a spoil. From this reference point, return of the islands is a gain, not simply a recovered loss.

Japan must also be cognizant of the isolation effect when framing a peaceful resolution with Russia. Japan should expect the return of Shikotan and Habomai upon a successful conclusion, but it cannot discount or ignore these gains simply because they are included in any successful resolution. Japanese leaders should emphasize the individual gain of the two islands and not relegate them as assumed concessions from the Russians.¹⁷⁶ This, combined with the framing factors previously mentioned, make Japan's best reference point the geographic status quo (but with accommodated losses). From here, any transition of territory is a gain, to include the "easy-wins" of Shikotan and Habomai. Just like the Russians, the Japanese can then focus negotiations on determining how much Kunashir and Iturup are "worth."

¹⁷⁴ Morris, "The 'Northern Territories' Dispute," 44–45.

¹⁷⁵ Jo Dee Catlin Jacob, "Introduction," in *Beyond the Hoppo Ryodo: Japanese-Soviet-American Relations in the 1990s*, ed. Jo Dee Catlin Jacob (Washington, DC: American Enterprise Institute Press, 1991), 3; and, Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, xi.

¹⁷⁶ Although this is nearly a diametric view from what the Russian must take, regarding the islands as bargaining chips.

2. Domain

The dispute over the Kurils is stable on the Japanese side, like the Russian, and Japan has also displayed risk-adverse behavior. While Japanese politicians like to default frame the Kurils as a loss, Japan can maintain a domain of gains by focusing on resolution gains identified by Allison, Kimura, and Sarkisov. Among them,

- i) Start discussion of a program for improving the lives of the islanders in areas where Japan's sovereignty is recognized during the transitional period.
- ii) Communicate unambiguously Japan's readiness to become a lead donor in a long-term program for Russian development in the Far East.
- iii) Make clear Japan's commitment to make the process of normalizing relations between the nations a positive-sum game in which Russia suffers no net loss, but rather the opposite: significant net gains in every important category, including security, politics and economics.¹⁷⁷

Japanese leaders can move past the emotional and symbolic rhetoric surrounding the Northern Territories and determine how valuable the islands are to regain. That is, how many gains is Japan willing to give Russia in order for Japan to receive its desired gains?

E. ARBITRATION

With both Japan and Russia in a domain of gains, the first hypothesis, *applicability*, postulates that arbitration will be more successful. This section will determine the *acceptability* and *durability* of the arbitrated results, which can determine the validity of the remaining two hypotheses.

1. The Game

As specified in Chapter III, setting up a game to model the Russian-Japanese Kuril dispute will incorporate the domain of each, start with ordinal payoffs, and then assign cardinal values to better analyze strategic positions.

¹⁷⁷ Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, xi–xii.

While multiple columns and rows could model the many options available to Japan and Russia, for simplicity a two-by-two grid is used, simplifying the outcomes to the most likely courses of action. These outcomes include “Peace,” which implies a peace treaty with the transfer of Shikotan and Habomai, and “Peace + α ,” with α being the additional considerations of Kunashir and Iturup, as well as the specifics of compensation, timing, modalities, etc.¹⁷⁸ This creates the game in Figure 22:

		Russia (gains)	
		Peace	Peace + α
Japan (gains)	Peace	(3,2)	(2,4)
	Peace + α	(1,1)	(4,3)

Figure 22. Kuril Islands dispute with ordinal payoffs.

In this game, Japan desires all four islands and achieves its best outcome if Russia accepts its offer (+ α). Russia’s best outcome is achieving peace with Japan, but not having to transfer more islands than necessary. The worst outcome for both occurs when their strategies do not align at Peace + α /Peace. This result can be described as the Russian asking price α as being “too high.” That is, the Russians have little interest in transferring additional islands, and the Japanese are not willing to pay an inflated price. Similarly, Peace/Peace + α , can be described as the Japanese offer α being “too low”—the Russians are willing to negotiate on the additional islands, but the Japanese offer α falls short of providing Russia sufficient gains. The stable status quo is assigned a payoff of (0,0) and would remain the outcome if negotiations break down; threats or security positions are not relevant to this dispute.¹⁷⁹

¹⁷⁸ ‘Peace + α ’ is adapted from Allison, Kimura, and Sarkisov’s proposed formula of “2 + α .” Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, xiii.

¹⁷⁹ With play of the game, each country does have a viable threat, however its use is unreasonable in this case, as the payoff would be above zero. A more credible threat would be walking out of arbitration and a return to the status quo, with a payoff of zero.

2. Strategic Positions

The Kuril Island game creates the movement diagram in Figure 23:

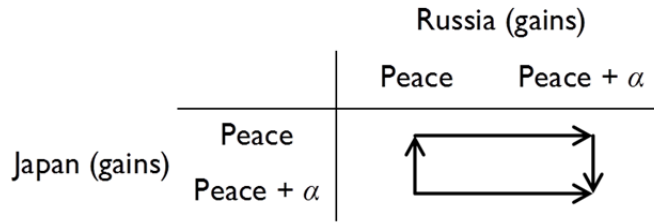


Figure 23. Kuril Islands dispute movement diagram.

Game play is analyzed without communication or cooperation in order to determine each player's strategic strengths or weaknesses. Russia has a dominant strategy to negotiate the value of α , but Japan does not have a dominant strategy. There is one strong equilibrium at Peace + α /Peace + α . This position is easy for Russia, as it only must be willing to listen to Japan's offer. Getting here is harder for the Japanese, however. They must find the domestic resolve and support to produce gains for Russia, making α as valuable as possible. If both countries play conservatively (their maximin strategy), they resolve at Peace/Peace + α , the second worse outcome for Japan, but Russia's best.¹⁸⁰

Within the game, Japan has a strong strategic position regarding first moves. They receive their best outcome at Peace + α /Peace + α , regardless of who moves first. This is a result of Russia's dominant strategy to always play Peace + α . What it lacks in a first move, however, Russia gains with a threat. This requires one-time, one-way communication (e.g., "Focusing only on α , will cause us to walk away.")¹⁸¹ Allowing first moves gets Japan its best payoff and

¹⁸⁰ Another benefit of Russia's dominant strategy.

¹⁸¹ While strategic moves based upon the payoffs prove the validity of Russia's threat, it does not seem credible when put in context, as Russia's dominant strategy is to negotiate on α . Interestingly, this threat seems to mirror Yeltsin's aborted visits to Japan in the early 1990s, see Allison, Kimura, and Sarkisov, *Beyond Cold War to Trilateral Cooperation*, ix.

Russia its second best payoff.¹⁸² While this result is better for Japan than playing conservatively, it is not for Russia. Russia gets its best payoff from both nations playing conservatively with a maximin solution at Peace/Peace + α . First moves, therefore, can be unfair in Russian eyes. In the end, arbitration can produce better results than non-communication or conservative play, as well as find a result that both countries find fair, increasing the likelihood of a durable solution.

To accomplish this, the ordinal scale game is transformed to an interval scale with cardinal payoffs. This produces the game in Figure 24.

		Russia (gains)	
		Peace	Peace + α
Japan (gains)	Peace	(5,7)	(2,10)
	Peace + α	(1,-7)	(10,8)

Figure 24. Kuril Islands dispute with cardinal payoffs.

Every Japanese payoff is positive (better than the status quo) because, as a minimum, they are receiving a gain of Shikotan and Habomai. Their lowest payoff at Peace + α /Peace is only a 1 because irredentist claims will likely continue—Japan wants to provide Russia with α , but Russia is unwilling to accept it at any price. Despite a gain of the two small islands, this outcome still leaves Japan unsatisfied. Japan's second worse outcome, Peace/Peace + α , also has a low payoff. In this case, the Japanese could negotiate their full claim, but fail because domestic politics prevent the level of support required to satisfy Russia.

Japan's second highest payoff of 5 still falls short of their goal. At Peace/Peace, the lack of domestic Japanese support for a comprehensive package is at least tempered by a lack of Russian willingness to negotiate on α . However, at Peace + α /Peace + α , Japanese aspirations are finally met. They

¹⁸² Assuming they know each other's payoffs.

have the domestic resolve to support a comprehensive package, and Russia is willing to accept. The Northern Territories are again Japanese, and the Russians are satisfied with their gains.

For the Russians, one outcome of arbitration is much worse than the status quo: Peace + α /Peace, with a payoff of -7. In this case, Japanese irredentist claims survive, as mentioned above, while Russia transfers territory and loses its bargaining chips of Shikotan and Habomai. While there is a formal peace treaty, there is hardly resolution to the Kuril Islands dispute and Russia gives up much strategic ground.

Russia's second worse outcome, however, is significantly better. At Peace/Peace, Russia still maintains the two large islands in the Southern Kurils, holds a signed peace treaty, and their strategy mirrored that of the Japanese. The outcome is uncontestable, although it may not be the most durable—future domestic Japanese politics may transition to a Peace + α viewpoint, and irredentist claims may again rise.

Russia's next best outcome is just slightly better with a payoff of 8 at Peace + α /Peace + α . At this junction, the dispute is fully resolved. Japan has its claim satisfied and Russia has internationally recognized claims on the remainder of the Kurils, plus Sakhalin. Russia also receives gains in political and economic dimensions. The only shortfall of this solution is the transfer Kunashir and Iturup.

Russia achieves its best outcome at Peace/Peace + α . Russia has a peace treaty, plus internationally recognized claims on the Kurils (to include Kunashir and Iturup) and Sakhalin. In addition, Russia does everything it can to resolve the territorial dispute. The international community recognizes Russian attempts to satisfy the Japanese, while the Japanese are viewed as inflexible with failed leadership. International support for any future Japanese claims on the

Kurils will decline and Russia can return to the previously indefensible position of “There is no territorial dispute with Japan. The Kuril islands are our territory.”¹⁸³

3. Cooperative Solution

Knowing that communication and cooperation in the game will produce the best results for both countries, Japan and Russia can apply Nash’s axiomatic approach to determine a fair outcome to implement, resolving their dispute over the Kuril Islands.

a. Graphical Nash Solution

The possible outcomes to the dispute are graphically represented by constructing a payoff polygon (Figure 25).

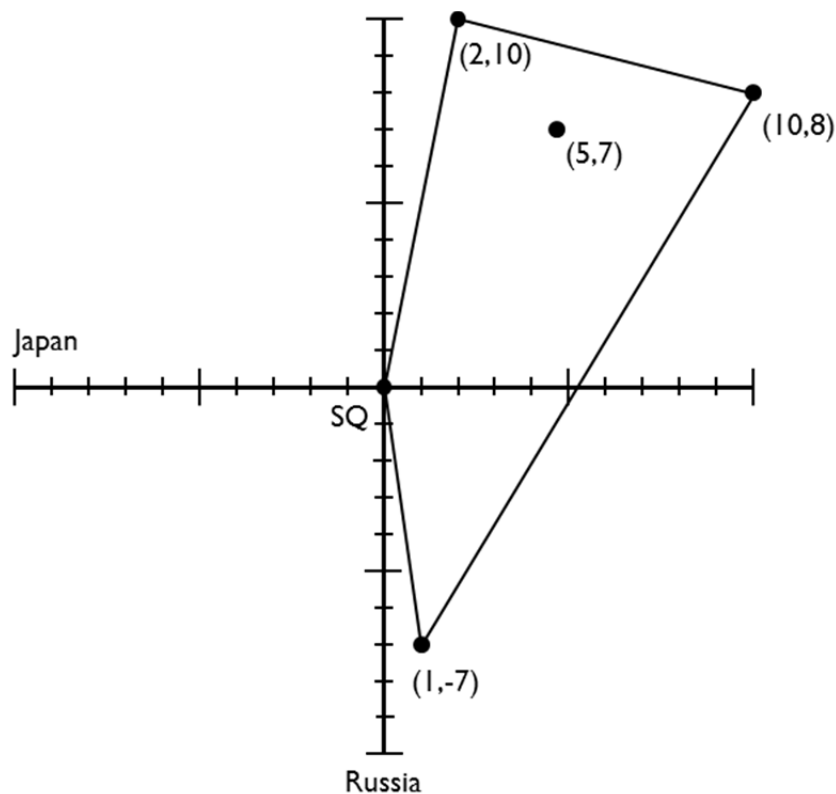


Figure 25. Kuril Islands dispute payoff polygon.

¹⁸³ “Japan Won’t Get Kuril Islands—Mironov,” *Russia Today*, January 31, 2012, <http://rt.com/politics/mironov-presidential-program-elections-139>.

The Pareto-optimal line in the first quadrant (i.e., greater than the status quo), bounded by the possible payoffs, defines the negotiation set (Figure 26). It can be seen that a triangle defined by the status quo at one corner and the Pareto-optimal as the hypotenuse will produce a graphical solution outside the negotiation set. That is, the graphical solution is “below and to the right” of (10,8). Therefore, sliding this “fair” point back along the Pareto-optimal line into the negotiation set produces the solution point N at (10,8).

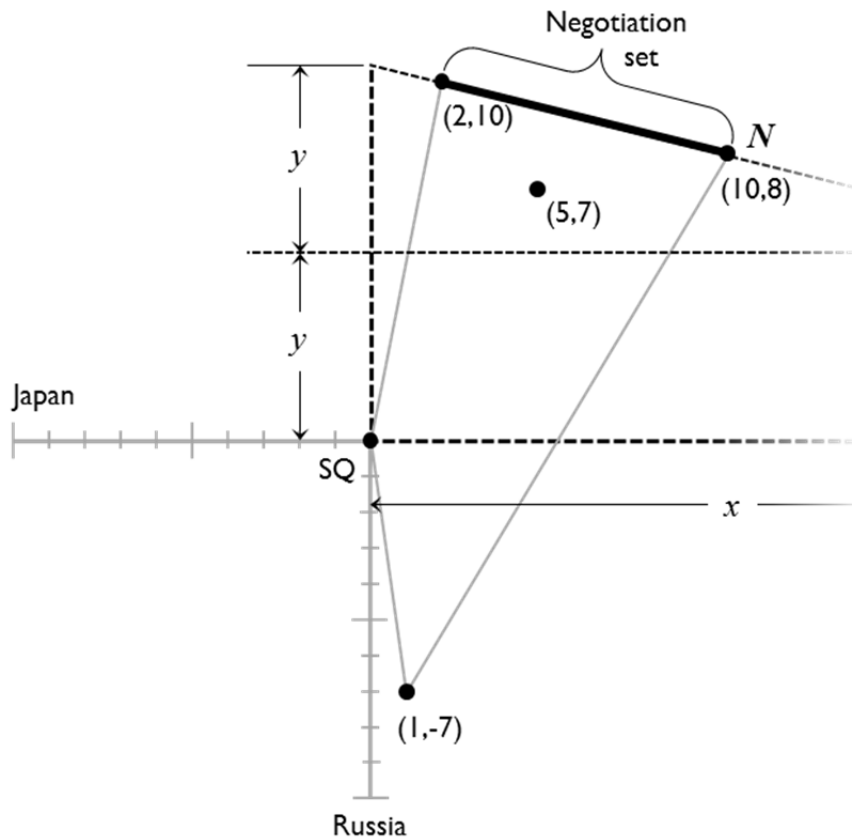


Figure 26. Kuril Islands dispute negotiation set and solution N .

b. Algebraic Nash Solution

The Nash point is algebraically computed using Equation (4) and substituting (0,0) for the status quo (X_o, Y_o) . Both a (height of Nash triangle) and m (slope of Pareto-optimal line) must be determined before the equation can be completed.

The equation for the Pareto optimal line from (2,10) to (10,8) is $y = mx + b$, where b is the y -intercept. Then,

$$m = (Y_2 - Y_1)/(X_2 - X_1) = (8 - 10)/(10 - 2) = -0.25$$

Then,

$$b = Y_1 - mX_1 = 10 - (-0.25)(2) = 10.5$$

Therefore, the Pareto optimal line is:

$$y = -0.25x + 10.5$$

With a (equal to b since $Y_o = 0$) and m determined, substitution into Equation (4) maximizes $(X - X_o)(Y - Y_o)$:

$$X_{Max} = X_o + a/(2|m|) = 0 + 10.5/[2(0.25)] = 21.00$$

$$Y_{Max} = Y_o + a/2 = 0 + 10.5/2 = 5.25$$

Therefore,

$$\text{Max} = (21, 5.25)$$

The maximum occurs at $X = 21$, which is beyond the negotiation set bounded by (10,8). Hence, the maximum of the negotiation set on the X -axis becomes the Nash solution point.

Therefore,

$$N = (10, 8)$$

c. Resolution

Japan obviously sees this solution as fair—they receive their best payoff. Russia, too, sees the solution as fair. It follows their dominant strategy, and although it does not provide them with their maximum payoff, the payoff value of 8 is significantly higher than the status quo (0), and well above their worst-case scenario (-7).

Geographic implementation of this solution is straightforward. Because the result is a pure strategy solution, no mixed-strategy calculations are required. Because $N = (10,8) = \text{Peace} + \alpha/\text{Peace} + \alpha$, Japan receives all four disputed islands of the South Kurils. Russia receives recognized sovereignty over Sakhalin and the remaining Kurils, plus diplomatic, economic, and political, gains. Negotiations determine the value of α . For example, how much will Japan invest in the Russian Far East, how long before Russian recognition of Japanese residual sovereignty over the Southern Kurils becomes implemented, and how is Russia integrated into Japanese security treaties?

4. Durability

Finding a Nash solution to the Kuril dispute at different points in time allows comparison between the geographic implementations of the solutions. This aids in determining the durability of current solution; the more the present solution is similar to previous solutions, the more durable it is.

This requires identifying key periods in the conflict and creating games to reflect the strategic positions. For simplicity, time periods previously defined in the dispute background will be used, specifically: 1855, 1875, 1905, 1945, 1951, and 1956. The games will be constructed with Seize/Don't Seize as strategy options, since Peace/Peace + α does not translate to all previous periods.¹⁸⁴

Because the payoffs for the present game are in relation to the current status quo, previous games must also use a similar datum in order to be generally compared. To accomplish this, previous period payoffs are initially assigned with a corresponding status quo of (0,0). From here, the period status quo is compared to the present status quo, and values linearly changed, as appropriate. For example, the 1855 status quo has Japan in control of the Southern Kurils. This is initially valued (0,0). Because the 1855 status quo equals a value of (10,8) in the present game, the 1855 payoffs are linearly adjusted by

¹⁸⁴ Scoping the present game to only the four islands in the current dispute admittedly weakens this analysis. Ideally, the durability games would include all the Kurils (and perhaps Sakhalin) to allow even comparison. For brevity and simplicity, however, this fault is accepted.

(10,8). This is an attempt to normalize datums for payoff comparisons.¹⁸⁵ Each periodic solution N has a corresponding geographic implementation with either pure or mixed strategies. The geographic implementations for each period are then compared to determine durability (see Figure 33 at the end of this section).

a. 1855

Japan and Russia have ratified the Shimoda Treaty as relatively equal, if not unknown, powers. While on an absolute scale Russia may be stronger, regionally it is not. The Empire is distracted by the Crimean War and treats an unknown Japan conservatively. As a result of the treaty, Japan controls Habomai, Shikotan, Kunashir, and Iturup, while Russia controls the remainder of the Kurils to the north. Sakhalin is ambiguously split north and south. The game in Figure 27 represents the strategic positions. The status quo is Japanese control of the Southern Kurils and half of Sakhalin, valued at (10,8).

		Russia (gains)	
		Seize	Don't Seize
Japan (gains)	Seize	(5,1)	(12,5)
	Don't Seize	(8,11)	(10,8)

Figure 27. Kuril dispute in 1855.

The arbitrated Nash solution for the game is $N = (10,8)$, a pure strategy solution of Don't Seize for each country; the status quo remains.

b. 1875

By 1875, the Japanese position has weakened. Russia has advanced into traditionally Japanese areas of Sakhalin and is asserting itself in

¹⁸⁵ This analysis is also weakened by the structure of the present day game, which is constructed to focus on the present solution, not to analyze previous periods. Future work should take a more holistic approach to durability analysis by not baselining it with a game optimized for the present, but rather use games created with identical structures. While this would provide a better durability analysis, it is beyond the scope of this thesis.

the sea-lanes. The Japanese shogunate has been replaced, and the Meiji government is establishing itself. Japan and Russia negotiate the Treaty of St. Petersburg, with Japan conceding claims on Sakhalin in exchange for all of the Kurils. This is largely a measure to protect the home island of Hokkaido from Russian aggression. The game in Figure 28 represents the strategic positions. The status quo is Japanese control of the entire Kurils (but none of Sakhalin), valued at (15,11).

		Russia (losses)	
		Seize	Don't Seize
Japan (losses)	Seize	(7,6)	(25,5)
	Don't Seize	(9,21)	(14,10)

Figure 28. Kuril dispute in 1875.

The arbitrated Nash solution for the game is $N = (17,3)$, a mixed strategy solution with Japan 50 percent Seize; Russia 50 percent Seize. Geographically, Japan and Russia would divide the value of the Kurils evenly, a point that would likely fall between Iturup and Urup, the dividing line of the Southern Kurils.

c. 1905

Japan soundly defeats Russia in the Russo-Japanese war. The Portsmouth Treaty concludes the war with Japan claiming all of Sakhalin and still maintaining control of the Kurils. The Japanese victory is a surprise to Western observers, and highlights Japan's rising power and colonial desires. The game in Figure 29 represents the strategic positions. The status quo is Japanese control of the entire Kurils (and all of Sakhalin), valued at (15,9).

		Russia (losses)	
		Seize	Don't Seize
Japan (losses)	Seize	(13,2)	(25,3)
	Don't Seize	(5,19)	(10,12)

Figure 29. Kuril dispute in 1905.

The arbitrated Nash solution for the game is $N = (16.25, 10)$, a mixed strategy solution with Japan 56.25 percent Seize; Russia 43.75 percent Seize. Geographically, Japan and Russia would divide the value of the Kurils marginally in favor of Japan, a point that would likely fall in Boussole Strait, north of Urup.

d. 1945

Japan has been soundly defeated in World War II and the Soviet Union seizes all the Kurils and Sakhalin. Japan is powerless to stop them. The game in Figure 30 represents the strategic positions. The status quo is Russian control of the entire Kurils (and all of Sakhalin), valued at (0,0).

		Russia (losses)	
		Seize	Don't Seize
Japan (losses)	Seize	(-5,-1)	(10,-10)
	Don't Seize	(-2,10)	(3,-5)

Figure 30. Kuril dispute in 1945.

The arbitrated Nash solution for the game is $N = (2, 3.3)$, a mixed strategy solution with Japan 33.3 percent Seize; Russia 66.6 percent Seize. Geographically, Japan and Russia would divide the value of the Kurils in favor of Russia, a point that would likely fall between Iturup and Kunashir.

e. 1951

While Japan is recovering from World War II, it is diplomatically weak and must acquiesce to American prerogatives. The United States uses the Treaty of San Francisco to formalize peace with Japan as much to isolate the Soviet Union. Despite Japanese reservations, the Kuril conflict is intentionally left unsettled to suit American Cold-War politics. The game in Figure 31 represents the strategic positions. The status quo is Russian control of the entire Kurils (and all of Sakhalin), valued at (0,0).

		Russia (gains)	
		Seize	Don't Seize
Japan (gains)	Seize	(-10,-10)	(5,-8)
	Don't Seize	(-2,10)	(-1,-5)

Figure 31. Kuril dispute in 1951.

The arbitrated Nash solution for the game is $N = (2,3.3)$. Although this is coincidentally the same value as in 1945, the strategy solutions are different, primarily due to the change in domains. Japan plays 33.3 percent Seize; Russia has a pure strategy solution of Seize. Geographically, the value of the Kurils is divided significantly in favor of Russia; Japan would likely receive only Shikotan and Habomai.

f. 1956

Japan and Russia acknowledge the untenable position of their diplomatic affairs. While the Joint Declaration ends the state of war, a peace treaty is not signed. Japan is willing to negotiate on the Kurils in an attempt to conclude the dispute, but American intervention causes the conflict to continue. The game in Figure 32 represents the strategic positions. The status quo is Russian control of the entire Kurils (and all of Sakhalin), valued at (0,0).

		Russia (gains)	
		Seize	Don't Seize
Japan (gains)	Seize	(-10,-10)	(6,-9)
	Don't Seize	(-1,10)	(-1,-6)

Figure 32. Kuril dispute in 1956.

The arbitrated Nash solution for the game is $N = (2.25, 4.09)$. Russia again plays a pure solution of Seize; Japan plays 29.55 percent Seize. Geographically, the value of the Kurils is again divided significantly in favor of Russia; Japan would likely receive only Shikotan and Habomai.

g. Analysis of Durability

The present day solution of Japanese control of the Southern Kurils appears durable. Geographically, it falls within the bounds of the theoretically previous arbitration results (Figure 33). However, it is a step away from the relatively recent arbitrated borders of 1951 and 1956, which clearly favored the Soviets. This is likely due to the factor of the side payment (α) in the present solution. Among the previously mentioned faults with this durability analysis is only the present solution accounts for side payments to influence framing. If side payments are stripped from the current game, the Japanese will control only Shikotan and Habomai (per the 1956 Joint Declaration), which mirrors the 1951 and 1956 solutions, as well as being close to the 1945 result. Again, signs the present-day solution is durable.

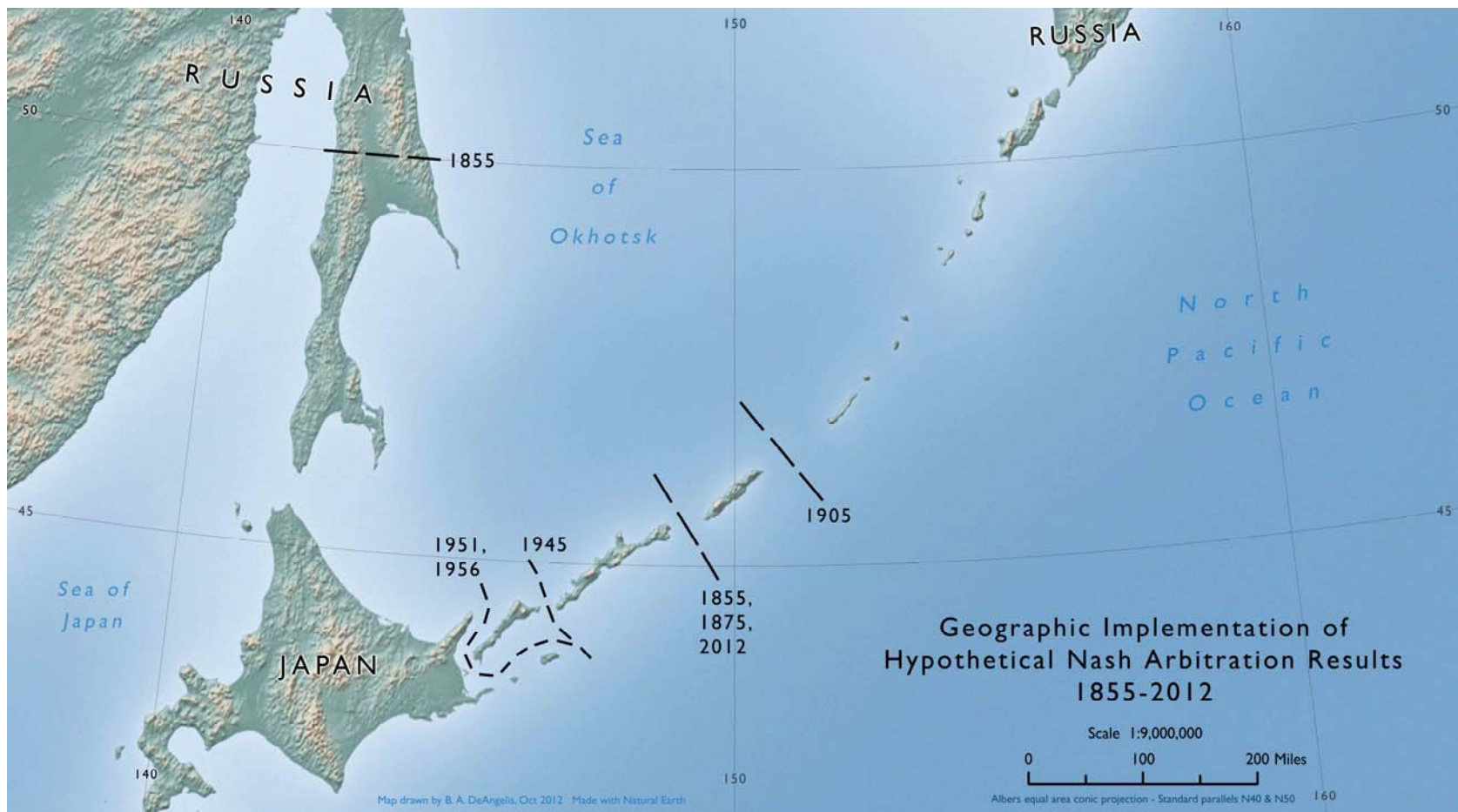


Figure 33. Geographic implementation of hypothetical Nash arbitration results.¹⁸⁶

¹⁸⁶ Map by author. Maps optimized for black and white printing are in Appendix B.

F. CASE STUDY SUMMARY

This chapter touched on some of the key periods in the Kuril Island dispute between Japan and Russia. Because the islands changed hands multiple times, it is difficult to objectively determine “who” should justifiably receive “what.” It is clear, however, that both sides have wrapped the dispute with emotions in order to pander to domestic politics. While the Kuril Islands no longer have the geo-strategic importance they had during the Cold War, they are important in terms of exclusive economic zones.

To resolve the dispute, both Russia and Japan should modify their default framing in order to ensure a domain of gains, enhancing the chance for successful arbitration. With the proposed game, Nash arbitration would result in Japanese sovereignty of Iturup, Kunashir, Shikotan, and Habomai. Russia would receive recognized sovereignty over Sakhalin and the remaining Kurils, plus substantial gains in diplomatic, economic and security realms. This arbitrated solution appears durable, as it aligns closely with theoretically arbitrated results at prior periods in the dispute.

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V. CONCLUSION

Territorial disputes often involve more than just a line on a map. Nationalism, resources, ethnicity, or other emotive causes fuel their complexity, and these are often found in combination. The enmity between factions creates difficult circumstances for the states to bi-laterally resolve their conflict, other than by open conflict. Arbitration, however, provides a non-violent means to resolve the dispute, and this thesis attempts to outline a process that produces applicable, acceptable, and durable results to territorial disputes.

Analyzing disputes with prospect theory shows that understanding and then constructing a proper frame for the conflict is paramount. If a state's default framing of a conflict is understood, then functions of prospect theory can be utilized to propose an alternate framing, which ideally would lead to a domain of gains. When states (or more specifically, their leaders) are in a domain of gains, territorial disputes are most arbitrable. This "gains frame" produces risk-adverse decision making, where a state is willing to concede on some grounds in order to prevent a larger loss on others. Determining the applicability of arbitration is only part the solution, however. Operationalizing an arbitration scheme and geographically implementing the result must also be completed.

Nash arbitration provides a constructive method for determining a fair and acceptable solution. In order to operationalize a Nash scheme, a non-zero-sum game is constructed that incorporates all the complexities of the dispute. Granted, the game reduces the dispute into a simple model, but it can provide a useful arbitration guideline if its payoffs are generated by thorough analysis of the conflict. From the payoffs and resulting solution N , geographic implementation is possible. Just as determining payoffs must be a comprehensive and educated process, so must be the drawing of new lines on a map. Geographically implementing a durable N is a process that must be informed by all the complexities that created the dispute. To disregard one will lead to a less durable solution.

Of course, this process is not a sure-fire method to resolve all territorial disputes. Statecraft and diplomacy will undoubtedly require larger roles than just properly framing a conflict. However, an acceptable and durable Nash solution provides a well-informed and accountable starting point for the process. As shown, it also provides a geographically implementable solution, as the conclusion of any territorial dispute will require some cartographic element.

Through case studies and modeling, this thesis has attempted to test the following hypotheses:

- H1) Territorial disputes are most arbitrable when both states are in a domain of gains.
- H2) If both states are in a domain of gains, the acceptability of Nash arbitration in territorial disputes increases.
- H3) Nash arbitration is most durable when dynamic dispute conditions generate fewer aberrations to results over time.

The results of these tests lead to implications for territorial dispute arbitration. First, framing the dispute is critical—both the overall context of the conflict, as well as the negotiation set utilized to resolve it. Before an outlined settlement can be agreed to, both parties need to be placed in a domain of gains. This will revolve around framing the conflict in such a way that history does not provide undue influence. Specifically, the prevention of future loss should be the focus, rather than the accounting of past losses. A failure in framing caused Russian President Yeltsin to cancel his visits to Japan in the early 1990s, nipping in the bud the Kuril Islands dispute's best chance at resolution in forty years.¹⁸⁷ With the context properly framed, the emphasis transitions to maintaining a domain of gains when dealing with negotiation set variables such as timing, modalities, and bargaining chips.

Second, arbitration must leverage the risk aversion of gains-frame parties by highlighting the costs (losses) associated with failure (e.g., loss of aid,

¹⁸⁷ The context surrounding the talks was 'how many islands will Russia return?' which did not place the Russians in a domain of gains.

sanctions, etc.) These serious risks should provide the incentive for negotiation-set choices to appear more appealing than the option of failure. In the Kuril dispute, both Japan and Russia have been able to fall back to a tenable status quo, forestalling resolution. Arbitration can stress “losing all” is a real result of failure (e.g., Japan will no longer have an internationally recognized claim on any islands). This implication is obviously closely tied to maintaining a domain of gains throughout the negotiation.

Finally, to be successful, arbitration must be able to provide suitable proposed gains. It is here that Nash’s scheme is beneficial. This thesis has shown that Nash arbitration results can be geographically implemented, and the method is also flexible enough to incorporate non-cartographic factors such as side payments (e.g., fishing rights, resource access, etc.) Nash’s scheme, as demonstrated by this thesis’s model, provides fair results to both parties that are not only applicable and acceptable, but they can be tested for durability as well.

Territorial conflicts predate the modern nation-state concept of defined borders, and will continue even when humanity moves on to other notions of sovereignty. These disputes will continue to challenge peace and prosperity, soldiers and statesmen, and thinkers and theories. This thesis hopes to add to the discussion in order to arrive at the ideal: a non-violent approach to resolving territorial disputes.

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APPENDIX A—HALA'IB TRIANGLE CASE STUDY VIGNETTE

A. INTRODUCTION

The “Hala’ib triangle” is a nearly 8,000-square-mile wedge of land along the Red Sea between the borders of Egypt and Sudan (Figure 34). The land is predominantly rocky and sandy, and has little inherent value at the surface. Oil and gas reserves, however, are likely offshore in the Red Sea.¹⁸⁸

The triangle was created as a result of the misalignment of two boundaries drawn by the British at the turn of the last century. The first boundary, referred to as the “political boundary,” was drawn in 1899 and delineated the border of Egypt and Sudan as the 22nd parallel. Three years later, in 1902, an “administrative boundary” was created that eased the implementation of the linear political border. Three areas were marked for transfer of administrative control because tribal grazing lands or railroads did not align with the political border. This later boundary granted the largest area, consisting of the Ababda tribal lands in the Hala’ib triangle, to Sudan, as its inhabitants were geographically and tribally closer to Khartoum.¹⁸⁹ Also created by the administrative boundary are the 800-square-mile quadrangle of Bir Tawil, and the 80-square-mile Wadi Halfa salient.¹⁹⁰

¹⁸⁸ Rongxing Guo, *Territorial Disputes and Resource Management: A Global Handbook* (New York: Nova Science Publishers, Inc., 2007), 132–133.

¹⁸⁹ Daniel J. Dzurek, “Parting the Red Sea: Boundaries, Offshore Resources and Transit,” Durham University International Boundaries Research Unit, *Maritime Briefing* 3 no. 2 (2001): 4.

¹⁹⁰ Bir Tawil is south of the 22nd parallel and adjacent to, but inland from, the Hala’ib triangle. Egypt was granted administrative control of the Beja tribal lands in this area, however, neither Egypt nor Sudan claim it, making it one of the few *terra nullius* areas on Earth. The Wadi Halfa salient is a finger of Sudan reaching north into Egypt along the Nile River. The salient ends where the navigable Nile once ended. This location was a transfer point for goods bound for Khartoum by rail, so the British granted Sudan control of the area for commercial ease. Lake Nasser, created by the Aswan dam, has flooded nearly the entire salient, making control of the area a negligible issue.



Figure 34. Sudan-Egypt border area.¹⁹¹

B. DISPUTE HISTORY

After Sudan's independence in 1956, Egypt claimed the 1899 political boundary (the 22nd parallel) as the border, while Sudan claimed the revised 1902 administrative boundary as the mutual border. Thus, both Egypt and Sudan claim the Hala'ib triangle and Wadi Halfa salient, and renounce Bir Tawil (as claiming the quadrangle would void their other claims).

Sudan has protested the presence of Egyptian troops in the Hala'ib triangle to international bodies numerous times, but joint control was essentially executed from the time Sudan gained independence. Tensions rose and fell during the decades, but they spiked in 1989 when Sudanese President Al-Bashir came to power after a coup. Sudan then granted a Canadian oil company exploration rights in the triangle in 1991, but the company withdrew until sovereignty issues were resolved. Through the 1990s, Sudan sought arbitration and referral of the dispute to the International Court of Justice for resolution. Egypt, however, has refused anything but bi-lateral discussions.

¹⁹¹ Map by author. Maps optimized for black and white printing are in Appendix B.

In December 1999, Egypt and Sudan agreed to resolve the dispute “in an integrational brotherly context that would form a lead in the process of full integration between the two countries.”¹⁹² Sudan unilaterally removed its forces in January 2000, effectively ceding the Hala’ib triangle to Egypt. Sudan reiterated its sovereignty of the area in 2004, but it remains under *de facto* Egyptian control.

C. THE GAME

Sudan and Egypt have an ancient and intertwined history. Egypt has been the dominant player during most, if not all, of that history. This explains Egyptian moves to control the Hala’ib triangle *de facto*, and hesitance to accept international resolution or arbitration; Egyptian leaders believe they control a stronger strategic position than Sudan in the dispute. Sudanese leaders seem to acknowledge their weakness regarding the Egyptians, but also recognize that they have a strong *de jure* claim on the Hala’ib triangle. This explains their willingness to submit the case to international action, including arbitration. This creates the game in Figure 35, with a status quo of Egypt playing Seize, Sudan playing Don’t Seize, and a payoff of (0,10).

		Egypt (losses)	
		Seize	Don’t Seize
Sudan (gains)	Seize	(-10,-9)	(10,-10)
	Don’t Seize	(0,10)	(2,-4)

Figure 35. Sudan-Egypt game (losses).

Without applying any framing techniques, Egypt understandably views any transfer of the Hala’ib triangle to Sudan as a loss. This makes successful arbitration unlikely, as evidenced by the history of the dispute over the past half-century. However, utilizing the principles of prospect theory, a solution can be presented to Egyptian leaders that emphasize the gains of resolution, as well as

¹⁹² Dzurek, “Parting the Red Sea,” 6.

the prevention of great loss. This can place Egyptian decision makers in a domain of gains, increasing the chances of successful arbitration results. Some possible gains for Egypt include:

- i) Recognized sovereignty over the Wadi Halfa salient and Bir Tawil
- ii) Recognized sovereignty over portions of the Hala'ib triangle
- iii) Development of offshore oil and gas fields because sovereignty issues are resolved
- iv) Conclusion of a lingering dispute with an otherwise strong partner nation, strengthening Egypt's position in the region

If Egypt is placed in a domain of gains, it creates the game in Figure 36, with a status quo of Egypt playing Seize, Sudan playing Don't Seize, and a payoff of (0,8).

		Egypt (gains)	
		Seize	Don't Seize
Sudan (gains)	Seize	(-10,-10)	(5,-5)
	Don't Seize	(0,8)	(10,10)

Figure 36. Sudan-Egypt game (gains).

In a domain of gains, Egyptian leaders realize the status quo is not their best payoff. A more valuable result can be achieved if Egypt has internationally recognized sovereignty within the Hala'ib triangle. Bargaining away a bit of the triangle in order to prevent any future loss of the territory would highlight Egyptian risk-aversion.

D. ARBITRATION AND IMPLEMENTATION

The game in Figure 35 (Egypt in a domain of losses) solves at $N = (0,10)$, the status quo. With Egypt in a domain of gains, Figure 36 solves at $N = (10,10)$, each country's best payoff. Payoff polygons and graphical solutions are represented in Figure 37.

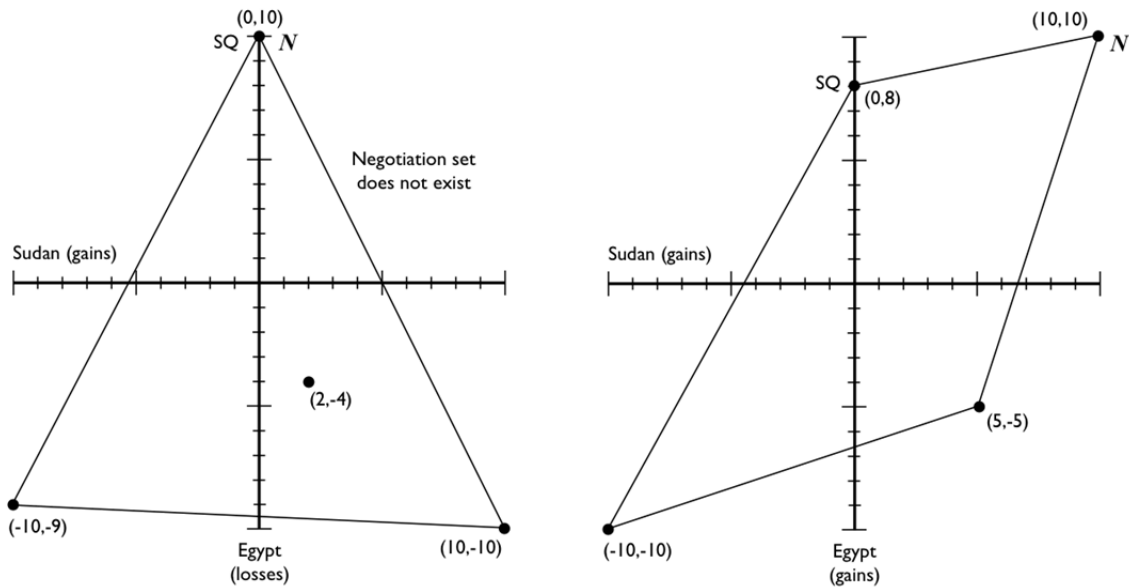


Figure 37. Payoff polygons and Nash solutions for Sudan-Egypt games.

When Egypt is in a domain of losses, there is no negotiation set, as it is impossible to improve Sudan's position without degrading Egypt's. Thus, the status quo at $(0,10)$ is the Nash solution. History backs up the strength of this position. However, if Egypt can frame the border dispute in alternative ways, the domain of gains provides the best payoff for each country. The Nash solution moves to $(10,10)$, as each country is able to fully develop their recognized sovereign land. Once Egypt sees the dispute not as just ceding land away, but the opportunity to achieve recognized sovereignty of the land, both countries benefit immensely.

This case provides an illustrative example for geographic implementation not seen in the Kuril Islands case. Because of the profile of the payoff polygons, the value of N is rather simple to determine graphically in both games. In the first game (Figure 35), there are no negotiation points above the status quo for either player; there is no negotiation set (i.e., it is empty). In the second game (Figure 36), it can be seen that as long as the value of Don't Seize is greater than 0 for Sudan and greater than 8 for Egypt, then each country's pure-strategy solution of Don't Seize provides one, and only one, Pareto optimal solution. In the Kuril

Islands case study, the ratio of mixed strategy solutions determined the geographic implementation of arbitration. In this case, however, that method will not work, as it does not reflect the strategic strengths of each player. Both Sudan and Egypt have a pure strategy of Don't Seize. This implies their best course of action is to submit to arbitration, but it does not provide the arbitrator any indication of one country's relative strength in the game over the other, or how the territory should be divided. Simply splitting the land evenly ignores Egypt's stronger position.

In dual Don't Seize strategy solutions such as this, each country's relative gains from arbitration must be compared in order to geographically implement the results. In Figure 36, Egypt moves from a payoff of 8 to 10 as a result of arbitration; Sudan moves from 0 to 10. Egypt's 2-unit move within a range of 20 units (-10 to 10) provides a relative increase of 10 percent. Sudan's 10-unit move with a range of 20 units provides an increase of 50 percent. The strength of each country's position is now evident by comparing their relative increase in gains; Sudan's perceived gains from arbitration are relatively five times greater than Egypt's. Thus, Sudan has much more to gain from arbitration than Egypt, which reflects Egypt's stronger strategic position in the game.¹⁹³ Translating these relative gains into fair divisions, Sudan receives 1/6th the value of the Hala'ib triangle, Egypt receives 5/6ths of the value—or 5 times Sudan's gain.¹⁹⁴

While the tribal inhabitants value the Hala'ib for its grazing (however meager), Egypt and Sudan both value the triangle for its 120 miles of Red Sea

¹⁹³ This method is based on the unpublished work of Frank Giordano and Gordon H. McCormick.

¹⁹⁴ Also, Bir Tawil and the Wadi Halfa salient should transfer to Egypt. Bir Tawil is valueless to Sudan, and the reasoning behind granting its administration to Egypt with the 1902 administrative boundary likely remains sound. Likewise, the Wadi Halfa salient is now useless to Sudan economically, and it is more appropriate for Egypt to administer north of the 22nd parallel at the upper (southern) reaches of Lake Nasser.

shoreline and the associated offshore resources. Even the namesake port town of Hala'ib is of marginal value compared to the potential natural resources.¹⁹⁵

Division of the Hala'ib triangle along the Wadi Shellal to the Red Sea, just south of the town of Hala'ib, will evenly distribute the wealth of the territory to both Egypt and Sudan (Figure 38).¹⁹⁶ This grants Egypt 100 miles of coastline, Sudan 20 miles. Presenting Egypt significantly more territory of the triangle reflects its strength in the dispute (and can reinforce its gains frame), and Sudan is equally satisfied with its gains, given its poor strategic position within the status quo.

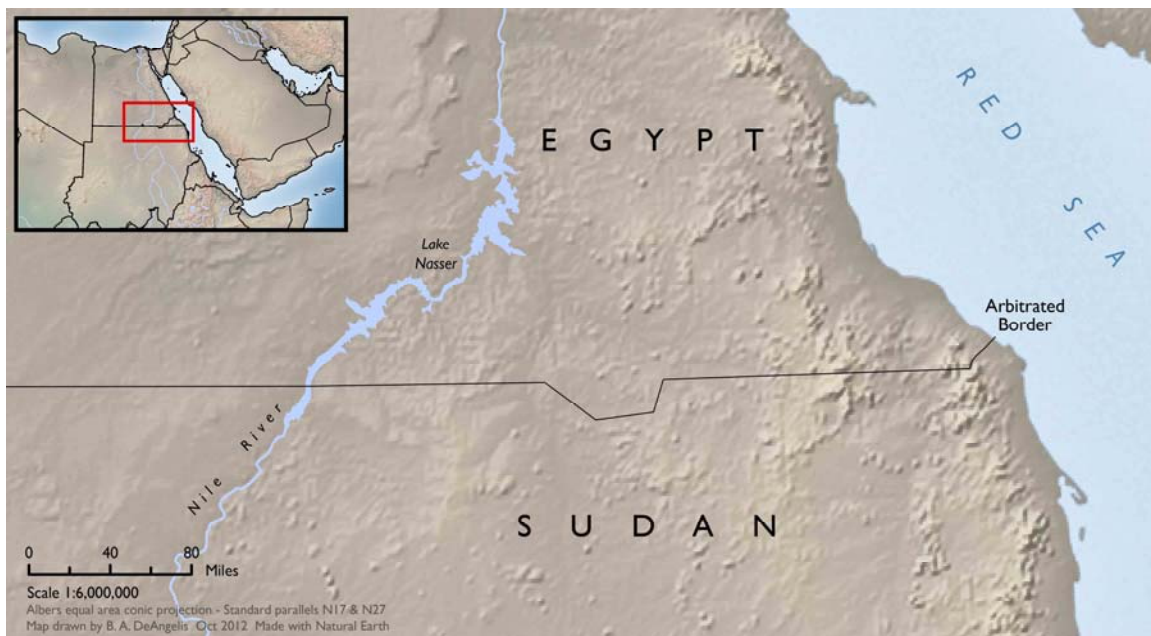


Figure 38. Sudan-Egypt border resolution.¹⁹⁷

¹⁹⁵ Egypt recently became a net importer of oil as domestic production has slumped. Sudan is heavily dependent on oil exports, and its firm relationship with China in this field could develop any Red Sea fields.

¹⁹⁶ Assuming offshore resources are evenly distributed. Actual exploration could improve delineation.

¹⁹⁷ Map by author. Maps optimized for black and white printing are in Appendix B.

E. CONCLUSION

The Hala'ib triangle vignette provides games and arbitration results complementary to the main Kuril Islands case study. Specifically, the Hala'ib dispute has conditions in which there is no negotiation set, as well as conditions that create a pure (Don't Seize) strategy solution for both states. The combined Kuril and Hala'ib case studies therefore cover all three possible Nash solution scenarios: 1) empty, 2) single point, and 3) mixed solution. This tests the model by applying it to the full range of possibilities, from modifying domains in the first scenario, to geographically determining borders in the second and third scenarios.

In the first scenario, when there is no negotiation set, prospect theory principles should be applied to ensure both belligerents are in a domain of gains. This increases the likelihood of successful arbitration by adjusting the payoffs each belligerent assigns to their strategies (due to the reflection effect), and can create a negotiation set when one previously did not exist.

In the second scenario, when both countries have a pure Don't Seize strategy solution, the arbitrator must factor in each nation's strategic strength within the game to determine border delineation. This is not inherent in a Don't Seize/Don't Seize Nash solution, as it is within mixed strategy solutions. In this instance, geographic implementation must be determined by comparing each country's relative gains from arbitration, and then awarding territory accordingly. Nash's scheme still determines the fair point, and the arbitrator has quantitative values to determine the best border.

Finally, when the scenario has a mixed strategy solution, geographic implementation is determined as shown in Chapter IV, where the ratio of strategies determines the delineation of the border.

All three scenarios involve the principles of prospect theory, which ultimately determines that arbitration is initially not applicable to the first game (evidenced by the empty Nash solution). Prospect theory allows the empty

solution game to be reframed, and ultimately creates a negotiation set, opening the door for resolution. The second and third scenarios highlight how Nash arbitration can provide an acceptable and durable solution to territorial disputes. While they have different methods for geographic implementation, they are still based on Nash's axiomatic approach. That is, they provide a solution that is both Pareto optimal and at or above the status quo (or security level) for each party, an appealing—and hopefully enduring—peace for both parties.

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APPENDIX B—ADDITIONAL MAPS

The following maps have been optimized for black and white printing. They are more legible than the full-color maps found within the thesis chapters if printed on a grayscale printer.

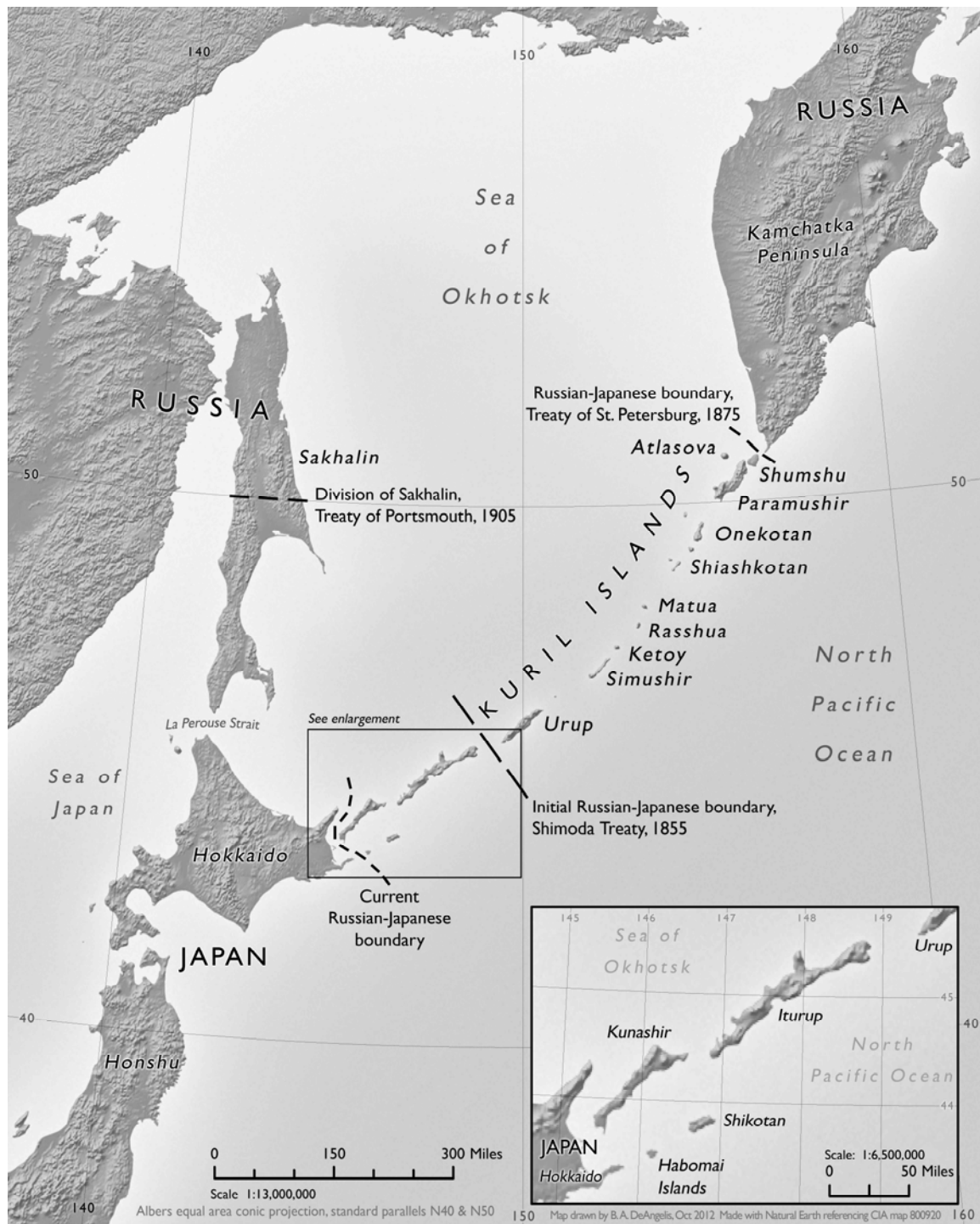


Figure 39. Kuril Island chain, grayscale.¹⁹⁸

¹⁹⁸ Map by author.

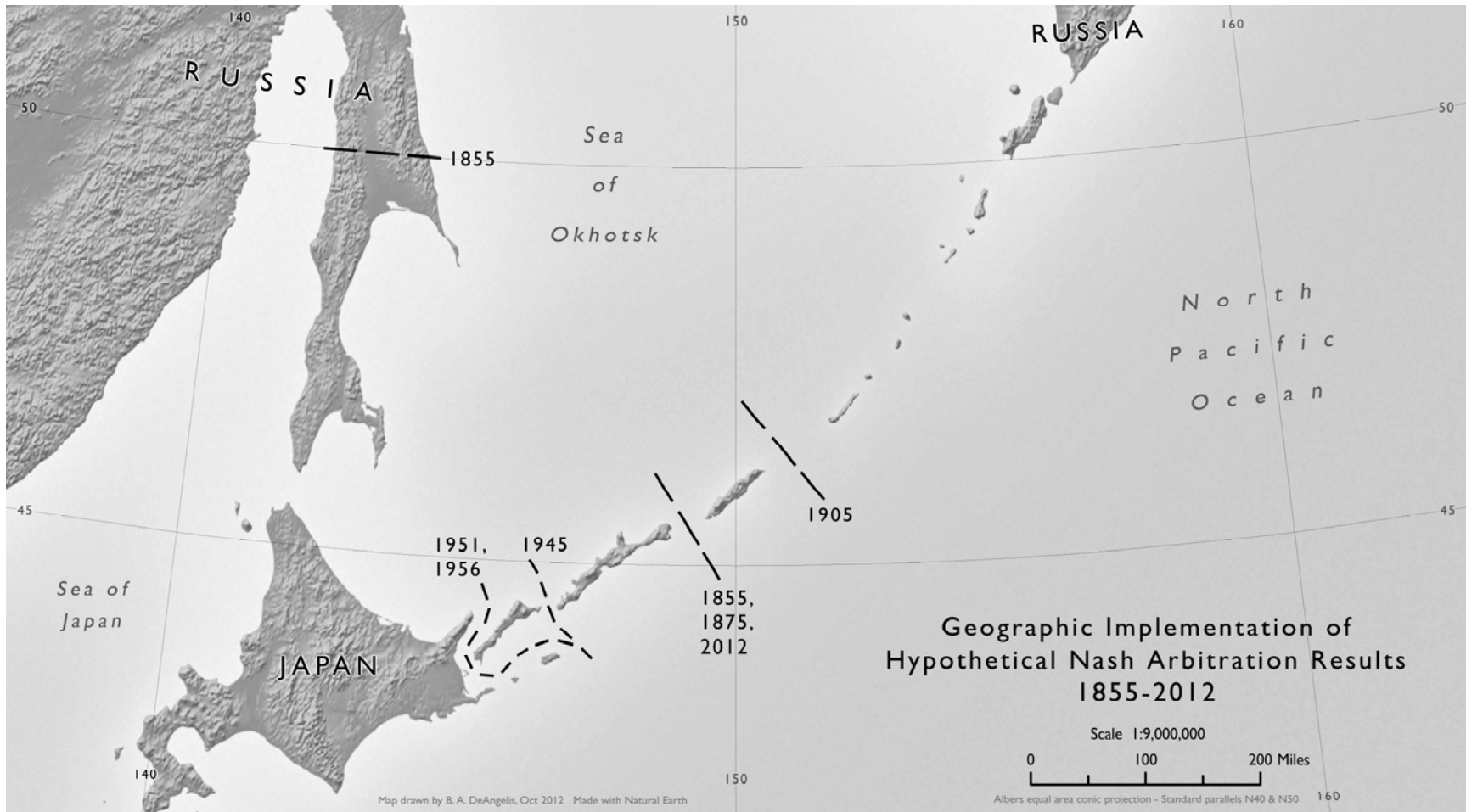


Figure 40. Geographic implementation of hypothetical Nash arbitration results, grayscale.¹⁹⁹

¹⁹⁹ Map by author.

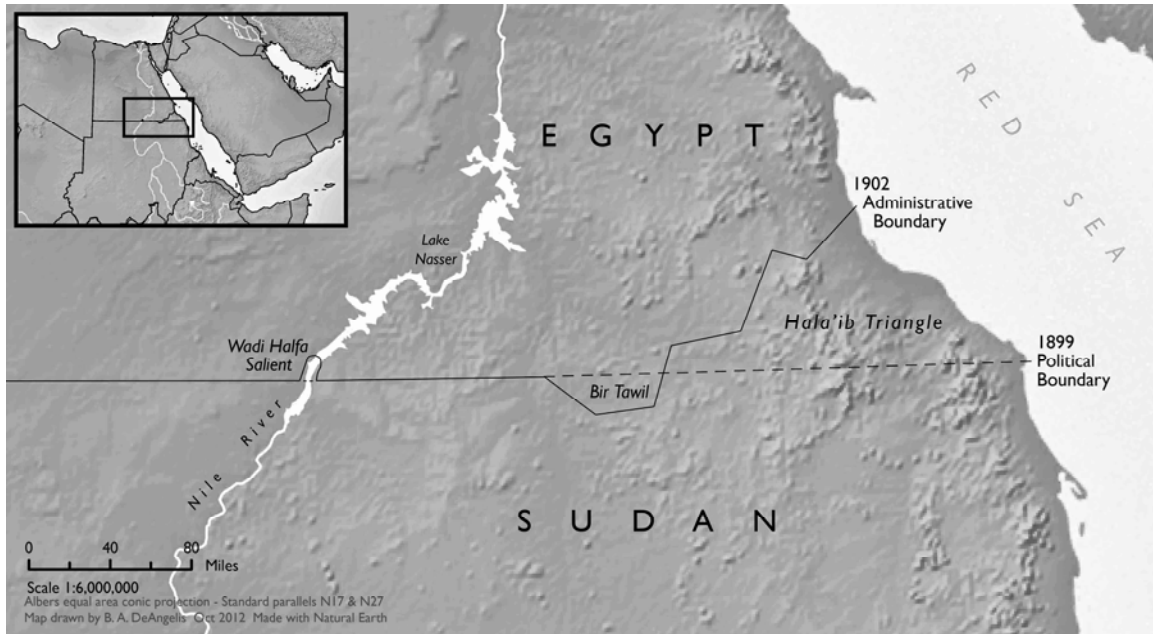


Figure 41. Sudan-Egypt border area, grayscale.²⁰⁰

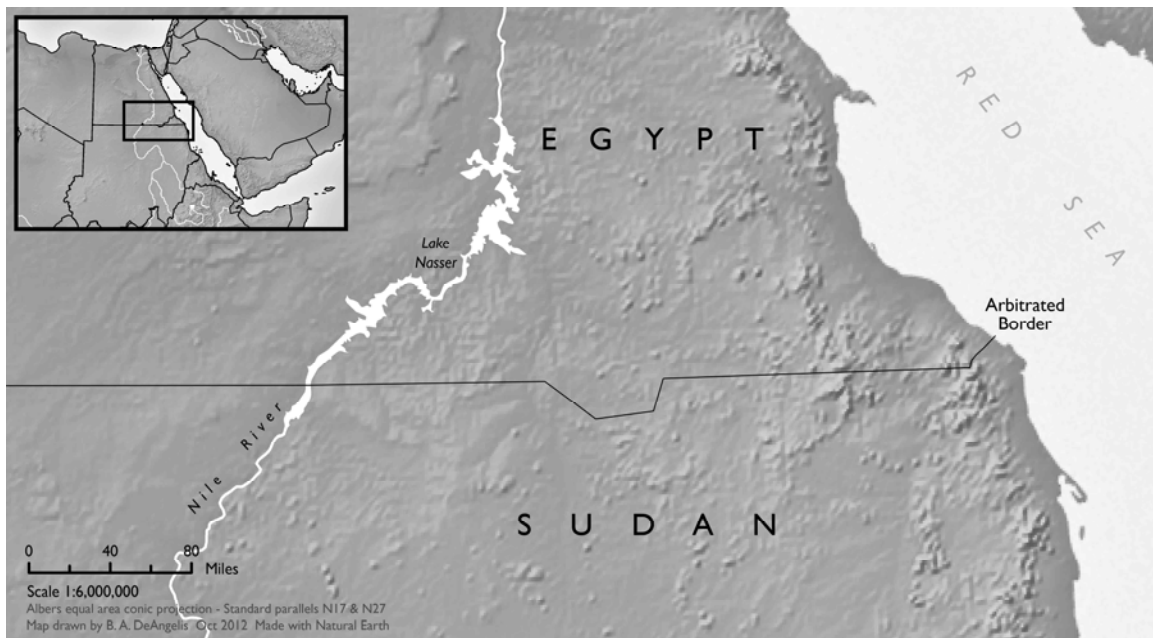


Figure 42. Sudan-Egypt border resolution, grayscale.²⁰¹

²⁰⁰ Map by author.

²⁰¹ Map by author.

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